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U.S. Department of the Interior
Bureau of Land Management
Wyoming State Office

Casper Field Office October 1999

DRAFT
Environmental Impact Statement for the Horse Creek Coal Lease Application
(Federal Coal Lease Application WYW141435)

2000-005610/NF

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MISSION STATEMENT

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

BLM/WY/PL-00/002+1320

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Wyoming State Office
P.O. Box 1828
Cheyenne, Wyoming 82003-1828

In Reply Refer To:

3420 (LBA) (930)
WYW141435
Horse Creek

October 14, 1999

Dear Reader:

This copy of the Draft Environmental Impact Statement (DEIS) for the Horse Creek Coal Lease Application, Bureau of Land Management (BLM) Serial Number WYW141435, is provided for your review and comments. This DEIS has been prepared to analyze the potential environmental and socioeconomic impacts of issuing a Federal coal lease for the Horse Creek coal tract located adjacent to the Antelope surface coal mine in southeastern Campbell County and northeastern Converse County, Wyoming.

A formal public hearing on the proposed Horse Creek coal lease application will be held at 7 p.m. on December 7, 1999, at the Holiday Inn, 2009 S. Douglas Highway, Gillette, Wyoming. The purpose of the hearing is to receive comments on the proposed coal lease sale, on the fair market value and maximum economic recovery of the Federal coal resources in the proposed Horse Creek tract, and on the DEIS. Prior to the formal hearing, there will be an open house at 6:30 p.m. at the above address to answer questions related to the coal lease-by-application process and this coal lease application.

BLM will accept comments on this DEIS, as well as on the issues of fair market value of the tracts, and maximum economic recovery of coal in the tracts for sixty (60) days commencing on the date the Environmental Protection Agency publishes its Notice of Availability in the Federal Register. We expect EPA will publish that notice on November 5, 1999. Comments received after the end of the 60-day comment period will be considered in the Final EIS if time permits.

If you wish to comment on the DEIS, we request that you make your comments as specific as possible. Comments will be more helpful if they include suggested changes, sources, or methodologies. Opinions or preferences will not receive a formal response. However, they will be considered and included as part of the BLM decision making process.

This DEIS was prepared pursuant to the National Environmental Policy Act and applicable regulations, and other applicable statutes, to address possible environmental and socioeconomic impacts that could result from this project. This DEIS is not a decision document. Its purpose is to inform the public of the impacts of leasing and mining the Federal coal proposed for lease in a maintenance coal lease application, and to evaluate alternatives to leasing and mining the proposed maintenance coal lease application.

Comments, including names and street addresses of respondents, will be available for public review at the address listed below during regular business hours (7:45 a.m. to 4:30 p.m.), Monday through Friday, except holidays, and will be published as part of the Final EIS. Individual respondents may request confidentiality. If you wish to withhold your name or street address from public review or from disclosure under the Freedom of Information Act, you must state this prominently at the beginning of your written comment. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public inspection in their entirety.

Please send (or e-mail) written comments to Bureau of Land Management, Casper Field Office, Attn: Nancy Doelger, 1701 East "E" Street, Casper, WY 82601 (casper_wymail@blm.gov, Attn: Nancy Doelger). E-mail comments must include the name and mailing address of the commenter to receive consideration. Written comments may also be faxed to (307) 234-1525.

If you have any questions, please contact Nancy Doelger at (307) 261-7627, or at the above address.

Sincerely,

Robert A Bennett

for

Alan R. Pierson
State Director

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Wyoming State Office
P.O. Box 1828
Cheyenne, Wyoming 82003-1828

3420 (LBA)
WYW141435
Horse Creek

October 25, 1999

NOTICE

Public Hearing Rescheduled

The date of the **formal public hearing** on the proposed Horse Creek coal lease application announced in the Dear Reader letter in this Draft Environmental Impact Statement has been **changed** from 7 p.m. on December 7, 1999, **to** 7 p.m. on **December 8, 1999**, at the Holiday Inn, 2009 S. Douglas Highway, Gillette, Wyoming.

Please contact Nancy Doelger at 307-261-7627 if you have any questions concerning this change.

HORSE CREEK COAL LEASE APPLICATION (WYW141435))
ENVIRONMENTAL IMPACT STATEMENT
ABSTRACT

[X] Draft [ ] Final

Lead Agency:
U.S. Department of the Interior
Bureau of Land Management

Cooperating Agency:
U.S. Department of the Interior
Office of Surface Mining Reclamation and Enforcement

Abstract:

This Draft Environment Impact Statement (EIS) assesses the environmental consequences of a federal decision to offer a federal coal tract located in southeastern Campbell County and northeastern Converse County, Wyoming for lease at a competitive, sealed bid sale, subject to standard and special lease stipulations. The Horse Creek Lease By Application (LBA) Tract as applied for by Antelope Coal Company includes approximately 2,840 acres containing approximately 356.5 million tons of federal coal. Antelope Coal Company operates the adjacent Antelope Mine and proposes to mine the Horse Creek LBA Tract as a maintenance tract for the existing mine, if a lease sale is held and they acquire the lease. This Draft EIS describes the physical, biological, cultural, historic, and socioeconomic resources in and surrounding the project area. The focus for impact analysis was based upon resource issues and concerns identified during previous coal leasing analyses and public scoping conducted for this lease application. Potential concerns related to development include impacts to groundwater, air quality, and wildlife and cumulative impacts related to ongoing surface coal mining and other proposed development in the Powder River Basin of Wyoming.

Comments on the draft EIS and requests for further information should be directed to:

Bureau of Land Management, Casper Field Office
Attn: Nancy Doelger
1701 East E Street
Casper, WY 82601
(307) 261-7627

Estimated date Draft EIS will be made available to Environmental Protection Agency and Public: November 5, 1999.

DRAFT

ENVIRONMENTAL IMPACT STATEMENT FOR THE HORSE CREEK COAL LEASE APPLICATION (FEDERAL COAL LEASE APPLICATION WYW141435)

Prepared for

U.S. Department of the Interior
Bureau of Land Management
Casper Field Office
Casper, Wyoming

and

Cooperating Agency

U.S. Office of Surface Mining
Reclamation and Enforcement
Denver, Colorado

by

Western Water Consultants, Inc.
Sheridan, Wyoming

NOVEMBER 1999

EXECUTIVE SUMMARY

On February 14, 1997, ACC[1] filed an application with the BLM for a maintenance coal lease for federal coal reserves located north and west of ACC's existing Antelope Mine (Figures ES-1 and ES-2). This coal lease application, which is referred to as the Horse Creek LBA Tract, was assigned case file number WYW141435. As applied for, this tract includes approximately 2,838 acres and approximately 357 million tons of in-place federal coal. The lands applied for in this application are located in southeastern Campbell County and northeastern Converse County, Wyoming, approximately 20 miles southeast of Wright, Wyoming.

This lease application was reviewed by the BLM, Wyoming State Office, Division of Mineral and Lands Authorization, and it was determined that the application and the lands involved met the requirements of the regulations governing coal leasing on application at Title 43 of the Code of Federal Regulations Part 3425.1 (43 CFR 3425.1). The application was also reviewed by the PRRCT at their public meeting on April 23, 1997, in Casper, Wyoming. At that time, the PRRCT recommended that the BLM process the lease application as an LBA. In order to process an LBA, the BLM must evaluate the quantity, quality, maximum economic recovery, and fair market value of the federal coal and fulfill the requirements of NEPA by evaluating the environmental impacts of leasing and mining the federal coal.

To evaluate the environmental impacts of leasing and mining the coal, the BLM must prepare an EA or an EIS to evaluate the site-specific and cumulative environmental and socioeconomic impacts of leasing and developing the federal coal in the application area. The BLM made a decision to prepare an EIS for this lease application.

BLM will use the analysis in this EIS to decide whether or not to hold a public, competitive, sealed-bid coal lease sale for the federal coal tract and issue a federal coal lease. If a sale is held, the bidding at that sale would be open to any qualified bidder; it would not be limited to the applicant. If a lease sale is held, a federal coal lease would be issued to the highest bidder at the sale if a federal sale panel determined that the high bid at that sale meets or exceeds the fair market value of the coal as determined by BLM's economic evaluation, and if the U.S. Department of Justice determines that there are no antitrust violations if a lease is issued to the high bidder at the sale. ACC previously applied for federal coal under the LBA process, was the successful high bidder when a competitive lease sale was held, and, in 1996, was issued a maintenance lease adjacent to this same mine.

Other agencies, including OSM, a cooperating agency on this EIS, will

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[1] Refer to page vii for a list of abbreviations and acronyms used in this document

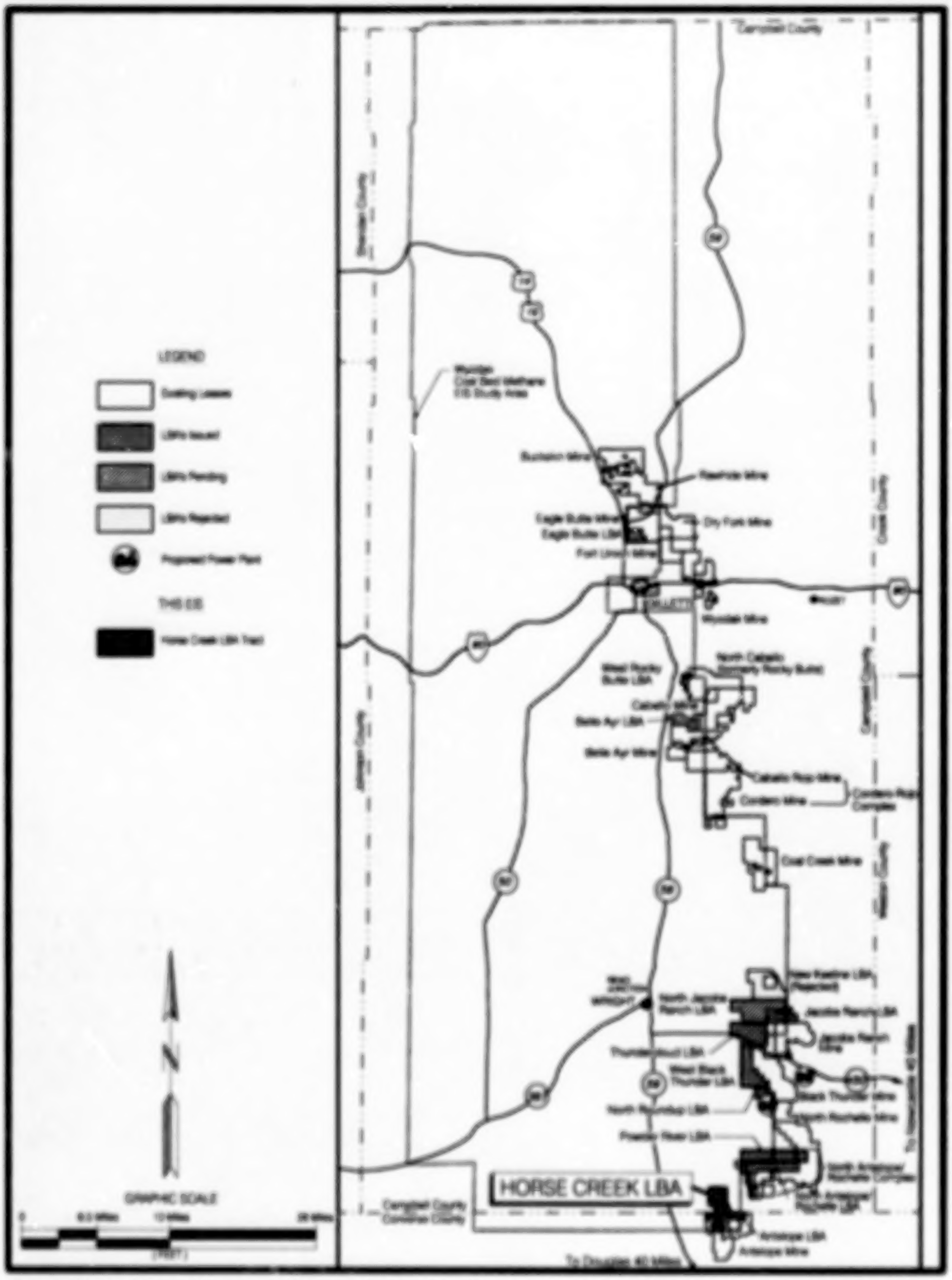

Figure ES-1. General Location Map with Federal Coal Leases, LBA's, and Wyodak Coal Bed Methane EIS Study Area.

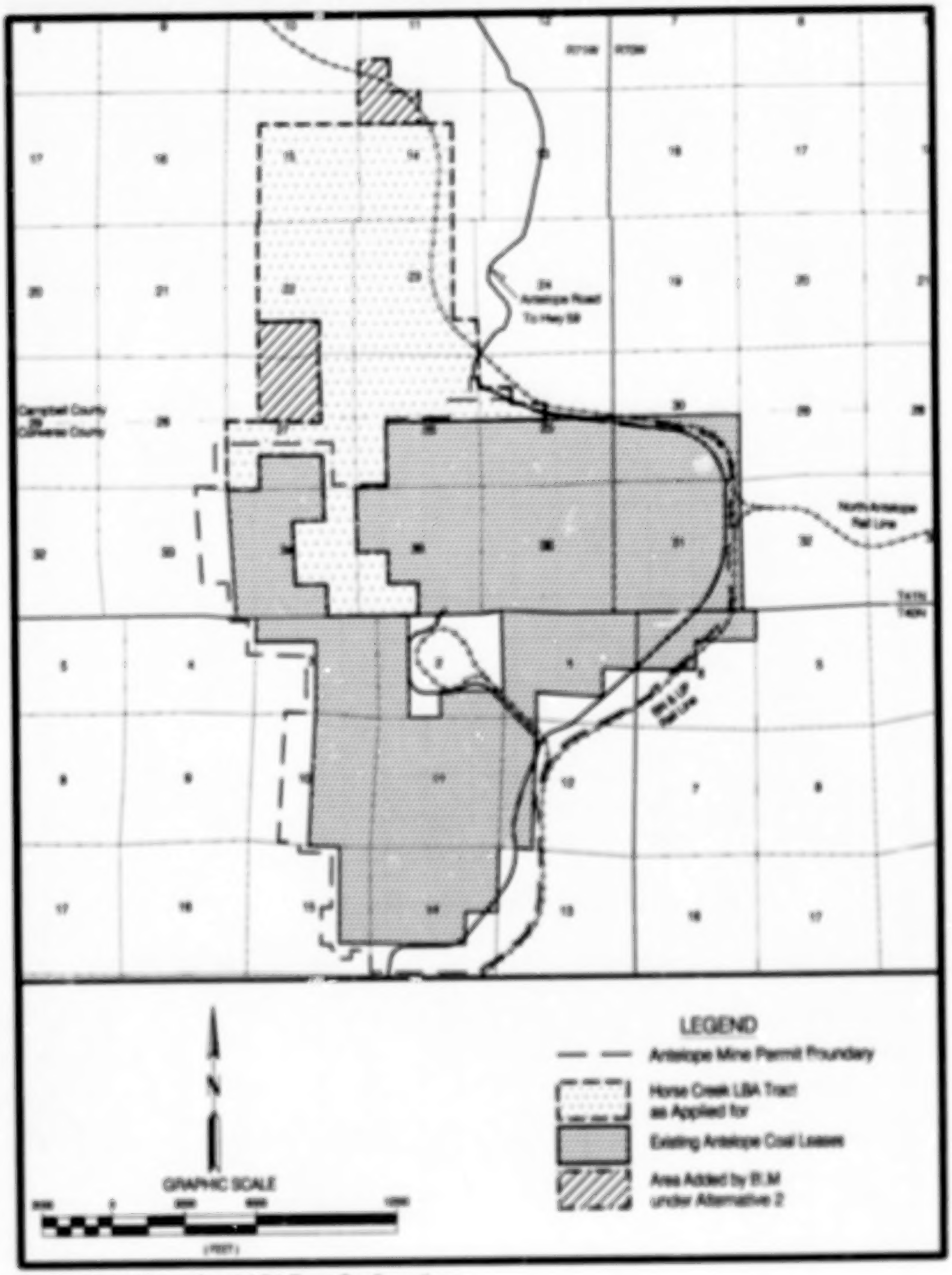

Figure ES-2. Horse Creek LBA Tract Configurations.

also use this analysis to make decisions related to leasing and mining the federal coal in this tract. The USFS is not a cooperating agency on this EIS. As a result of a recent land exchange, there are currently no federal surface lands managed by the USFS included in the Horse Creek LBA Tract.

The lands in the Horse Creek LBA Tract have been subjected to four coal planning screens and determined acceptable for consideration for leasing. A decision to lease the federal coal lands in this application would be in conformance with the BLM Resource Management Plans for the Buffalo and Casper Field Offices. A portion of the Horse Creek LBA Tract is located within the BN & UP Railroad right-of-way. This coal will not be mined because it was determined to be unsuitable for mining according to the coal leasing unsuitability criteria. It was included in the tract to allow maximum recovery of the mineable reserves adjacent to the right-of-way. ACC estimates that the Horse Creek LBA Tract includes approximately 264.5 million tons of mineable coal under the Proposed Action. ACC's approved mining plan also avoids disturbing the Antelope Creek Valley, so any coal resources in the Horse Creek LBA Tract that are beneath Antelope Creek would not be recovered.

The LBA sale process is, by law and regulation, an open, public, competitive sealed-bid process. If a lease sale is held for this LBA tract, the applicant (ACC) may not be the successful high bidder. The analysis in this EIS assumes that ACC would be the successful bidder on the Horse Creek LBA Tract if a sale is held, and that it would be mined as a maintenance tract for the Antelope Mine.

This DEIS analyzes three alternatives:

The Proposed Action is to hold a competitive coal lease sale and issue a maintenance lease to the successful bidder for the Horse Creek LBA Tract as applied for (Figure ES-2). Under this alternative, ACC projects that coal production would increase to 30 mmtpy and employment would increase to 250 persons.

Alternative 1 is the No Action Alternative. Under this alternative, the LBA tract would not be leased, but the existing leases at the Antelope Mine would be developed according to the existing approved mining plan. Under this alternative, ACC projects that average annual production would probably not exceed 22 mmtpy and average employment would remain at 180 persons.

Alternative 2 considers holding a competitive coal lease sale and issuing a maintenance lease to the successful bidder for the Horse Creek LBA Tract as reconfigured by BLM (Figure ES-2). BLM developed an amended tract configuration in order to avoid a potential future bypass situation and/or to enhance the value of the federal coal that is still unleased in this area. Under this alternative, the Horse Creek LBA Tract includes 3,215.0 acres and approximately 298 million tons of mineable federal coal. Production and employment would be similar to the Proposed Action.

Table ES-1 summarizes coal production, surface disturbance, and mine life for the Antelope Mine under each alternative. The environmental impacts of mining the LBA tract would be similar under the Proposed Action and Alternative 2.

Other alternatives that were considered but not analyzed in detail include holding a competitive coal lease sale and issuing a lease to thesuccessful bidder (not the applicant) for the purpose of developing a new stand-alone mine, and delaying the competitive sale of the LBA tract.

Critical elements of the human environment (BLM 1988) that could be affected by the proposed project include air quality, cultural resources, floodplains, Native American religious concerns, threatened, endangered, and candidate (T&E) plant and animal species, hazardous or solid wastes, water quality, wetlands/riparian zones, environmental justice, and invasive nonnative species. Four critical elements (areas of critical environmental concern, prime and unique farmland, wild and scenic rivers, and wilderness) are not present in the project area and are not addressed further. In addition to the critical elements that are potentially present in the project area, the EIS discusses the status and potential effects of the project on topography and physiography, geology and mineral resources, soils, water availability or quality, alluvial valley floors, vegetation, wildlife, land use and recreation, paleontological resources, visual resources, noise, transportation resources, and socioeconomics.

The project area is located in the PRB, a part of the Northern Great Plains that includes most of northeastern Wyoming. The Horse Creek LBA Tract is located in the south-central part of the PRB. The elevation ranges from about 4,500 to 4,800 ft in an area of dissected uplands. In the LBA tract, there are two mineable coal seams, referred to as the Anderson and Canyon. The Anderson coal seam averages 40 feet in thickness on the LBA tract and the Canyon coal seam averages 35 feet. The average overburden thickness is about 150 ft. The interval between the two coal seams is variable but averages about 45 feet.

The existing topography on the LBA tract would be substantially changed during mining. A highwall with a vertical height equal to overburden plus coal thickness would exist in the active pits. Some spoil and topsoil would be stockpiled for later reclamation, some would be directly

Table ES-1. Summary Comparison of Coal Production, Surface Disturbance, and Mine Life for Horse Creek LBA Tract and Antelope Mine

Item	**No Action Alternative (Existing Antelope Mine)**	**Added by Proposed Action**	**Added by Alternative 2**
Mineable Coal (as of January 1, 1999)	198 million tons	264.5 million tons	299.7 million tons
Recoverable Coal [1] (as of January 1, 1999)	183.7 million tons	246.0 million tons	278.7 million tons
Coal Mined Through 1998	98.8 million tons	--	--
Lease Acres	6,008.9 acres	2,837.9 acres	3,215.0 acres
Total Area To Be Disturbed	5,172.0 acres	3,189.6 acres	3,580.9 acres
Permit Area	7,683.3 acres	3,189.2 acres	3,580.0 acres
Average Annual Post-1998 Coal Production	22 million tons	8 million tons	8 million tons
Remaining Life Of Mine (post-1998)	9 years	8 years	9 years
Average No. Of Employees	180	70	70
Total Projected State Revenues (post-1998)[2]	$ 202.1 million	$ 270.6 million	$ 306.6 million[4]
Total Projected Federal Revenues (post-1998)[3]	$ 45.9 million	$ 90.6 million	$ 102.6 million[4]

[1] Assumes 95 percent recovery of leased coal remaining after eliminating coal within 100 feet of the railroad and county road rights of way.

[2] Projected revenue to State of Wyoming is $1.10 per ton of coal sold and includes income from severance tax, property and production taxes, sales and use taxes, and Wyoming's share of federal royalty payments (University of Wyoming 1994).

[3] Federal revenues based on $4.00/ton price x federal royalty of 12.5 percent x amount of recoverable coal plus bonus payment on LBA coal of 22¢/ton based on average of last nine LBA's (see Table 1-1) x amount of leased coal less state's 50 percent share.

[4] The projected federal and state income shown under this alternative may be overstated. The inclusion of the higher-cover coal added under Alternative 2 would probably reduce the per ton bonus price relative to Alternative 1, which would decrease the anticipated state and federal revenues.

placed into the already mined pit. Horse Creek would be diverted into temporary channels or blocked to prevent flooding of the pits. Following reclamation, the average surface elevation would be approximately 36 ft lower due to removal of the coal. The reclaimed land surface would approximate premining contours and the basic drainage network would be retained, but the reclaimed surface would contain fewer, gentler topographic features. This could contribute to reduced habitat diversity and wildlife carrying capacity on the LBA tract. These topographic changes would not conflict with regional land use, and the postmining topography would adequately support anticipated land use.

The geology from the base of the coal to the land surface would be subject to considerable long-term change on the LBA tract under either action alternative. An average of 150 ft of overburden, 45 ft of interburden and 75 ft of coal would be removed from the LBA tract. The replaced overburden would be a relatively homogeneous mixture compared to the premining layered overburden.

Development of other minerals potentially present on the LBA tract could not occur during mining, but could occur after mining. Coal bed methane associated with the coal at the time it is mined would be irretrievably lost.

Consequences to soil resources from mining the LBA tract would include changes in the physical, biological, and chemical properties. Following reclamation, the soils would be unlike premining soils in texture, structure, color, accumulation of clays, organic matter, microbial populations, and chemical composition. The replaced topsoil would be much more uniform in type, thickness, and texture. It would be adequate in quantity and quality to support planned postmining land uses (i.e., wildlife habitat and rangeland).

Moderately adverse short-term impacts to air quality would be extended onto the Horse Creek LBA Tract during the time it is mined if a lease is issued. Dust would be visible to the public when mining occurs near County Road 37 and Antelope Road. TSP concentrations would be elevated in the vicinity of mining operations on the LBA tract, but would not violate federal or Wyoming primary and secondary standards outside the mine's permit boundary, even when combined with emissions from adjacent mines. Concentrations of gaseous emissions would remain within acceptable federal and state standards. Federal and state air quality standards have not been exceeded by all existing industrial development in the southeastern PRB, including the existing mines. This is not predicted to change as a result of mining the LBA tract.

Streamflows in Horse Creek would be diverted or captured during mining. Changes in runoff characteristics and sediment discharges would occur during mining of the LBA tract, and erosion rates could reach high values on the disturbed areas because of vegetation removal. However, state and federal regulations require that surface runoff from mined lands be treated to meet effluent standards, so sediment would be deposited in ponds or other sediment-control devices. After mining and reclamation are complete, surface water flow, quality, and sediment discharge would approximate premining conditions.

Mining the LBA tract would increase both the area of lowered water levels in the coal and overburden aquifers, and the area where the existing coal and overburden aquifers would be replaced by mine backfill. Drawdown in the continuous coal aquifer would be expected to increase roughly in proportion to the increase in area affected by mining and would extend farther than drawdown in the discontinuous overburden aquifers. The data available indicate that hydraulic properties of the backfill would be comparable to the premining overburden and coal aquifers. Total dissolved solids levels in the backfill could initially be expected to be higher than in the premining Wasatch Formation aquifer, but would be expected to meet Wyoming Class III standards for use as stock water.

Based on previous AVF determinations, it is unlikely that any portions of Horse Creek on the LBA tract meet the criteria to be AVF's significant to agriculture. AVF's that are not significant to agriculture can be disturbed during mining but must be restored as part of the reclamation process. Antelope Creek Valley would not be disturbed by mining at the Antelope Mine under the approved mining and reclamation plan. Jurisdictional wetlands that are disturbed by mining must be replaced during the reclamation process.

Mining would progressively remove the native vegetation on the LBA tract. Reclamation and revegetation of this land would occur contemporaneously with mining. Reestablished vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The majority of these species would be native to the LBA tract. Initially, the reclaimed land would be dominated by grassland vegetation which would be less diverse than the premining vegetation. Estimates for the time it would take to restore sagebrush to premining density levels range from 20 to 100 years. An indirect impact associated with this vegetative change would potentially be a decreased big game habitat carrying capacity. However, a diverse, productive, and permanent vegetative cover would be established on the LBA tract within about 10 years following reclamation, prior to release of the final reclamation bond. The decrease in plant diversity would not seriously affect the potential productivity of the reclaimed areas, and the proposed postmining land uses (wildlife habitat and rangeland) should be achieved even with the changes in vegetation composition and diversity. The reclamation plans for the LBA tract would also include steps to control invasion by weedy (invasive, nonnative) plant species. The surface of the LBA tract is privately owned, and the private landowners would have the right to manipulate the vegetation on their lands as they desire once the final reclamation bond is released. No T&E or candidate plant species have been found on the Horse Creek LBA Tract in surveys to date.

In the short term, wildlife would be displaced from the LBA tract in areas of active mining and the acreage of habitat available for wildlife populations would be reduced; however, the LBA tract does not contain any unique or crucial big game habitat, and habitat would be disturbed in parcels, with reclamation progressing as new disturbance occurs. In the long term, following reclamation, carrying capacity and habitat diversity may be reduced due to flatter topography, less diverse vegetative cover and reduction in sagebrush density.

T&E wildlife surveys specific to the proposed lease tract have not yet been conducted, but would be required prior to any ground-disturbing activities. During the wildlife survey that was undertaken for the LBA tract, no T&E species were observed. No critical habitat for T&E species has been identified in the surveys done to date for the LBA tract.

Active mining would preclude other land uses. Recreational use of the LBA tract would be severely limited during mining. Within 10 years after initiation of each reclamation phase, rangeland and wildlife use would return to near premining levels. The cumulative impacts of energy development (coal mining, oil and gas) in the PRB are and will continue to contribute to a reduction in hunting opportunities for some animals (pronghorn, mule deer, and sage grouse).

Mining would also impact oil and gas development on the leased lands during active mining. There are currently no oil or gas wells on the LBA tract, but most of the federal oil and gas rights are leased. New drilling would not be possible in areas of active mining, but could potentially take place in areas not being mined, or in reclaimed areas. Potential for development of coal bed methane resources on the LBA tract would be lost with the removal of the coal.

Cultural resources on the LBA tract would be impacted by mining, but adverse impacts would be mitigated through data recovery and/or avoidance of significant properties. Formal Wyoming State Historic Preservation Office (SHPO) consultation is required for concurrence with determination of the eligibility of sites for inclusion on the National Register of Historic Places (NRHP) prior to mining. The eligible cultural properties on the LBA tract which cannot be avoided or which have not already been subjected to data recovery action would be carried forward in the mining and reclamation plan as requiring protective stipulations until a testing, mitigation, or data recovery program is developed in consultation with the SHPO.

No sites of Native American religious or cultural importance are known to occur on the LBA tract. If such sites or localities are identified, they will be taken into consideration.

No unique or significant paleontological resources have been identified on the Horse Creek LBA Tract, and the likelihood of encountering significant paleontological resources is small.

Mining activities at the existing Antelope Mine are currently visible from County Road 37 and the Antelope Road, and mining activities on the Horse Creek LBA Tract would also be visible from these local access roads. Mining would affect landscapes classified by BLM as VRM Class IV, and the landscape character would not be significantly changed following reclamation. No unique visual resources have been identified on or near the LBA tract.

Impacts from noise generated by mining activities on the LBA tract are not expected to be significant due to the remote nature of the site.

No new or reconstructed transportation facilities would be required under the Proposed Action or Alternative 2. Leasing the LBA tract would extend the length of time that coal is shipped from the permitted Antelope Mine. Active pipelines and utility lines would have to be relocated in accordance with previous agreements, or agreements would have to be negotiated for their relocation.

Royalty and bonus payments for the coal in the LBA tract would be collected by the federal government and split with the state. A 1994 University of Wyoming study estimated that the total direct fiscal benefit to the State of Wyoming from coal mining taxes and royalties is $1.10/ton of coal mined. Using that estimate, the tax and royalty benefit to the State of Wyoming of mining the coal in the Horse Creek LBA Tract under the action alternatives would range from $270.6 to $306.6 million. Mine life, and thus employment, would be extended 8 to 9 years at the Antelope Mine, and ACC projects that employment at the mine would increase by up to 70 people.

With regard to Environmental Justice issues, it was determined that potentially adverse impacts do not disproportionately affect minorities, low-income groups or Native American tribes or groups. No tribal lands or Native American communities are included in this area, and no Native American treaty rights or Native American trust resources are known to exist for this area.

Under the No Action Alternative, the impacts described in the preceding paragraphs to topography and physiology, geology and minerals, soils, air quality, water resources, alluvial valley floors, wetlands, vegetation, wildlife, threatened, endangered and candidate species, land use and recreation, cultural resources, Native American concerns, paleontological resources, visual resources, noise, transportation, and socioeconomics would occur on the existing Antelope coal leases, but these impacts would not be extended onto the LBA tract.

In the case of surface coal mining, SMCRA and state law require a considerable amount of mitigation and monitoring. If impacts are identified during the leasing process that are not mitigated by existing required mitigation measures, then BLM can include additional mitigation measures as stipulations on a new lease. No mitigation or monitoring measures beyond those required by SMCRA or state law have been identified as necessary for the Horse Creek LBA Tract at this time.

Cumulative impacts result from the incremental impacts of an action added to other past, present, and reasonably foreseeable future actions, regardless of who is responsible for such actions. Cumulative impacts can result from individually minor, but collectively significant, actions occurring over time.

Since decertification of the Powder River Federal Coal Region in 1990, the BLM Wyoming State Office has issued 9 federal coal leases containing approximately 2.365 billion tons of coal using the LBA process. This leasing process has undergone the scrutiny of two appeals to the Interior Board of Land Appeals and one audit by the General Accounting Office.

The Wyoming BLM has received applications for four additional federal coal tracts containing approximately 1.75 billion tons of coal, including the Horse Creek LBA LBA Tract. The PRRCT has reviewed all of these applications, and has recommended processing three of them. At a public meeting held in Casper, Wyoming on April 23, 1997, the PRRCT recommended that the BLM not process the New Keeline lease application for a potential new mine start at this time. The BLM Wyoming State Director subsequently rejected that application without prejudice in a decision signed on June 13, 1997. That decision is under appeal. The three pending LBA's recommended for processing include approximately 1.075 billion tons of federal coal.

The Wyoming and Montana BLM state offices completed a study entitled "*Powder River Basin Status Check*" in 1996. The purpose of this study was to document actual mineral development impacts in the Powder River Basin from 1980 to 1995 and compare them with mineral development impacts that were predicted to occur by 1990 in the five previously prepared Powder River Basin regional EIS's. The status check was updated prior to the 1997 and 1999 PRRCT public meetings in Casper, Wyoming and Billings, Montana.

Four of the previously prepared regional EISs evaluated coal development in the Powder River Basin in Wyoming. They are:

Final Environmental Impact Statement, Eastern Powder River Coal Basin of Wyoming, BLM, October 1974;

Final Environmental Impact Statement, Eastern Powder River Coal, BLM, March 1979;

Final Environmental Impact Statement, Powder River Coal Region, BLM, December 1981;

Draft Environmental Impact Statement, Round II Coal Lease Sale, Powder River Region, BLM, January 1984.

For Wyoming, the status check compared actual development in Campbell and Converse counties with predictions in the 1979 and 1981 Final EIS's, and USGS Water Resources Investigations Report 88-4046, entitled "*Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin*," by Martin and others.

In 1998, Campbell and Converse Counties produced approximately 297.5 million tons of coal, according to the records of the Wyoming State Inspector of Mines. In 1980 total state production was 94 million tons of coal. The increasing state production is primarily due to increasing sales of low-sulfur, low-cost PRB coal to electric utilities who must comply with Phase I requirements of Title III of the 1990 Clean Air Act Amendments. Electric utilities account for 97% of Wyoming's coal sales. Oil production has decreased in the Wyoming Powder River Basin since 1990. In recent years, more wells have been plugged annually than have been drilled.

Natural gas production in the Wyoming PRB has been increasing due to the development of shallow coal bed methane resources in Campbell County, just west of the coal mines. Since 1992, the BLM has prepared five environmental assessments (EA's) and one EIS analyzing coal bed methane development projects in the PRB. A second EIS is currently being completed to evaluate the impacts of existing and proposed development [the *Wyodak Coal Bed Methane Project Draft and Final Environmental Impact Statements* (BLM 1999, BLM 1999b)]. Under the current process for approving coal bed methane drilling, coal bed methane wells can be drilled on private and state oil and gas leases after approval by the Wyoming Oil and Gas Conservation Commission and the Wyoming State Engineer's Office. On federal oil and gas leases, BLM must analyze the individual and cumulative environmental impacts of all drilling, as required by NEPA, before coal bed methane drilling can be authorized. Approximately 88% of the coal rights in the current coal bed methane project area are federal but only about half of the oil and gas rights in this area are federal.

Water and methane are produced from the coal by coal bed methane wells, and the area of coal bed methane development in the PRB is west of the existing coal mines. Therefore, the potential exists for overlapping groundwater drawdown in the coal if both resources are produced. Currently, coal bed methane development in the vicinity of the group of the five mines nearest the LBA tract is limited, but based on current trends, it is likely that development will continue southward in the direction of these mines. If coal bed methane is developed adjacent to the five southern mines, the resulting groundwater withdrawal from the Wyodak coal would overlap additively with groundwater drawdown in the Wyodak caused by coal mining.

Other mineral development levels in the Wyoming PRB are currently lower than predicted in the EIS's. In the 1970's, significant uranium development was anticipated in southwest Campbell County and northwest Converse County. This development did not materialize because the price of uranium dropped in the early 1980's. There are currently three *in situ* uranium operations in Converse and Johnson counties, but no mines and no mills. Uranium production has been increasing since 1990. The increase is partially due to higher uranium prices, particularly in 1996 and 1997.

In addition to the ongoing coal and coal bed methane development, four other projects were in progress or planned during the preparation of this EIS in the vicinity of the southern mine group: 1) North Rochelle Mine facilities and rail loop; 2) the ENCOAL Plant, which would be located within the rail loop at the North Rochelle Mine; 3) the Two Elk power plant, which would be located east of the Black Thunder Mine; and 4) construction and use of the proposed DM&E rail line. Air quality, water quantity and employment levels in particular may be cumulatively impacted if these projects are added to existing coal mining and coal bed methane production. The duration of these cumulative impacts would be extended by leasing the LBA tract.

The existing and proposed development in the PRB has and will continue to result in the introduction of additional roads, railroads, power lines, fences, mine structures, and oil and gas production equipment. This area has already undergone change from a semi-agriculturally based economy to a coal mining and oil and gas economy. Environmentally, the open, basically treeless landscape has been visibly altered by construction, equipment, and human activities. Leasing of the LBA tract would increase the total area that would be affected by mining but would not cause a significant cumulative change in daily impacts because mining disturbance is progressive, and reclamation proceeds contemporaneously. Cumulative impacts vary by resource and range from being almost undetectable to being substantial. Cumulative impacts on air quality, groundwater quantity and wildlife habitat (particularly antelope) have created the greatest concern. A regional cumulative impact analysis was performed for this EIS to estimate impacts on air quality in the year 2015. This analysis was an update and modification to the far-range cumulative air quality analysis prepared for the Wyodak Coal Bed Methane Project EIS. Tables ES-2 and ES-3 show the results of this analysis.

Table ES-2. Results of Air Quality Impact Analysis (µg/m^3)

Area	Annual NO_2	24-hr PM_{10}	Annual PM_{10}	3-hr SO_2	24-hr SO_2	Annual SO_2
CUMULATIVE IMPACTS						
Northern Cheyenne Reservation, MT	0.03	0.58	0.02	1.60	0.56	0.01
Badlands National Park, SD	1.25	0.65	0.10	3.61	1.20	0.21
Wind Cave National Park, SD	0.15	0.62	0.06	2.17	0.84	0.08
Class I PSD Increment	**2.5**	**4**	**8**	**25**	**5**	**2**
Black Elk Wilderness, SD	0.09	1.04	0.05	2.48	0.79	0.07
Jewel Cave National Monument, SD	0.13	0.76	0.08	3.92	0.87	0.09
Mt. Rushmore National Monument, SD	0.08	1.01	0.05	1.93	0.55	0.06
Cloud Peak Wilderness, WY	0.01	0.90	0.04	1.08	0.32	0.01
Devils Tower National Monument, WY	0.12	0.80	0.16	2.84	0.50	0.06
National Ambient Air Quality Standard	**100**	**150**	**50**	**1300**	**365**	**80**

Table ES-3. Predicted Annual Days of Visibility Reductions At Class I and Class II Sensitive Areas from Cumulative Sources

Location	Type of Area	Number of Days deciview change >0.5	Number of Days deciview change >1.0
Northern Cheyenne Reservation	Class I	18	8
Badlands National Park	Class I	173	70
Wind Cave National Park	Class I	94	45
Black Elk Wilderness	Class II	66	28
Jewel Cave National Monument	Class II	72	32
Mt. Rushmore National Monument	Class II	58	22
Cloud Peak Wilderness	Class II	15	4
Devils Tower National Monument	Class II	70	28

Note: The Northern Cheyenne Reservation is a redesignated Class I area and is not addressed by existing visibility regulations which apply to the federally mandated Badlands and Wind Cave Class I areas.

Figure ES-3 shows modeled and extrapolated worst-case coal aquifer drawdown as a result of mining at the southern group of mines. Monitoring of backfill areas indicates that reclaimed areas are being recharged with water generally suitable for livestock use (the premining use).

Wildlife habitat quality has declined in the PRB due to a continuing trend of landscape fragmentation from roads, rail lines, oil and gas wells, coal mines, and fences. Mining of the LBA tract would add to this habitat fragmentation. Wildlife monitoring indicates that wildlife are using reclaimed areas.

This EIS presents the BLM's analysis of environmental impacts under authority of the NEPA and associated rules and guidelines. The BLM will use this analysis to make a leasing decision. The decision to lease these lands is a necessary requisite for mining, but is not in itself the enabling action that will allow mining. The most detailed analysis prior to mine development would occur after the lease is issued, when the lessee files an application for a surface mining permit and mining plan approval, supported by extensive proposed mining and reclamation plans, to the Wyoming Department of Environmental Quality.

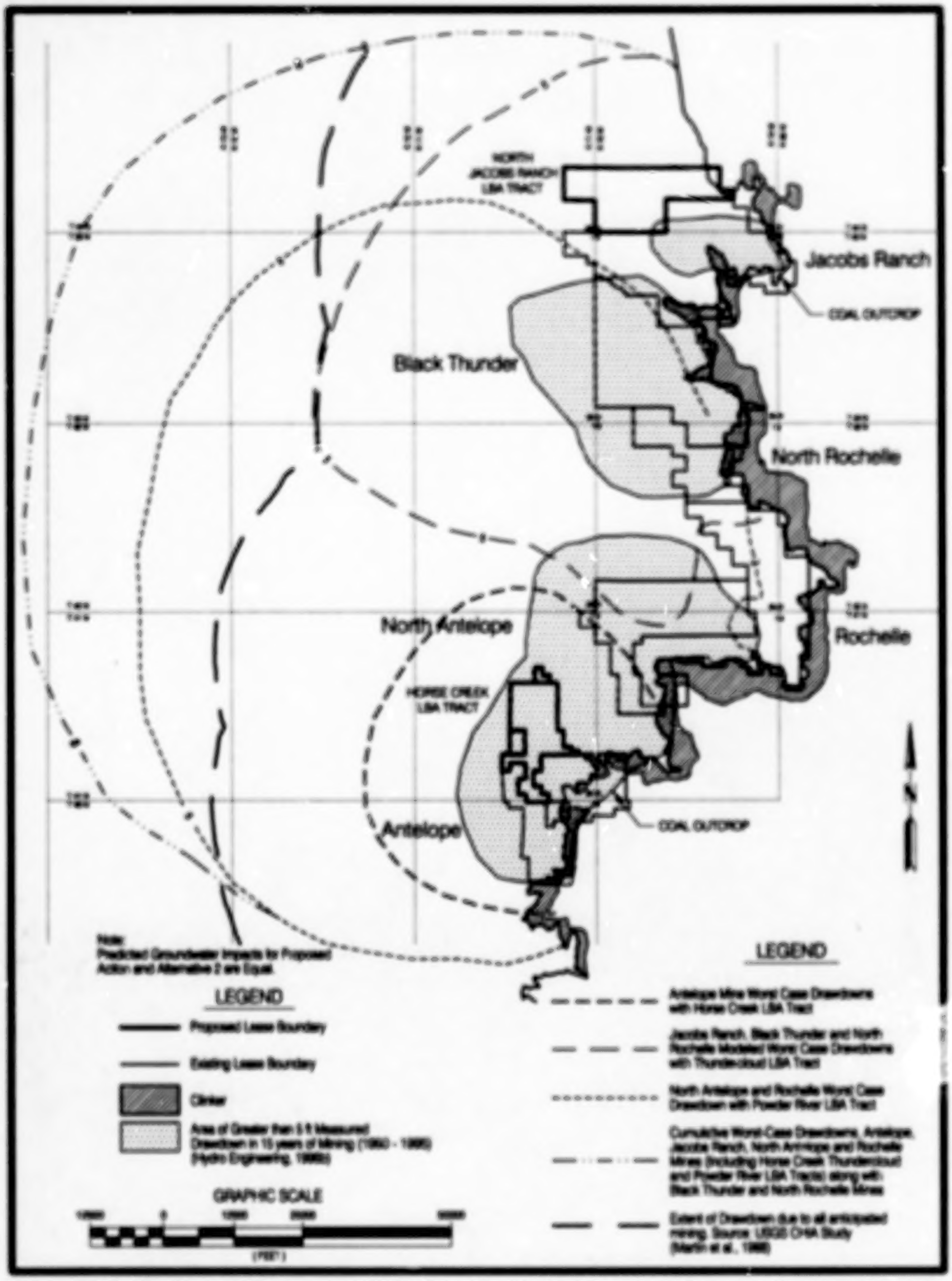
NORTH JACOBS RANCH LBA TRACT
Jacobs Ranch
COAL OUTCROP
Black Thunder
North Rochelle
North Antelope
Rochelle
HORSE CREEK LBA TRACT
Antelope
COAL OUTCROP
Note:
Predicted Groundwater Impacts for Proposed Action and Alternative 2 are Equal.
LEGEND
Proposed Lease Boundary
Existing Lease Boundary
Clinker
Area of Greater than 5 ft Measured Drawdown in 15 years of Mining (1980 - 1995) (Hydro Engineering, 1996)
GRAPHIC SCALE
0
(FEET)
LEGEND
Antelope Mine Worst Case Drawdowns with Horse Creek LBA Tract
Jacobs Ranch, Black Thunder and North Rochelle Modeled Worst Case Drawdowns with Thundercloud LBA Tract
North Antelope and Rochelle Worst Case Drawdown with Powder River LBA Tract
Cumulative Worst-Case Drawdowns, Antelope, Jacobs Ranch, North Antelope and Rochelle Mines (including Horse Creek Thundercloud and Powder River LBA Tracts) along with Black Thunder and North Rochelle Mines
Extent of Drawdown due to all anticipated mining. Source: USGS CHIA Study (Martin et al., 1988)

Figure ES-3. Modeled and Extrapolated Worst-Case Coal Aquifer Drawdown Scenarios Showing Extent of Actual 1995 Drawdowns and USGS Predicted Cumulative Drawdowns.

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Abbreviations and Acronyms Used in this Report

ACC	Antelope Coal Company
ANC	acidification neutralization capacity
ac-ft	acre-foot, acre-feet
ac-ft/yr	acre-foot per year, acre-feet per year
AQRV	air quality related values
ARCO	Atlantic Richfield Company
AREV	SEO water rights database and program
AVF	alluvial valley floor
BACT	best available control technology
bcy	bank cubic yards
BLM	Bureau of Land Management
BN-UP, BN&UP	Burlington Northern-Union Pacific
B.P.	before present
Btu	British thermal units
Btu/lb	British thermal units per pound
CBM	coal bed methane
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
CHIA	Cumulative Hydrologic Impact Assessment
CO	carbon monoxide
COE	U.S. Army Corps of Engineers
CREG	Consensus Revenue Estimating Group
cy	cubic yards
dBA	A-weighted decibels
DEIS	Draft Environmental Impact Statement
DM&E	Dakota, Minnesota & Eastern Railroad Corporation
DOI	Department of the Interior
EA	Environmental Assessment
EC	elemental carbon particles
EIS	Environmental Impact Statement
ENCOAL	Encoal Corporation
EPA	Environmental Protection Agency
F	Fahrenheit
FCLAA	Federal Coal Leasing Act Amendments of 1976
FEA	Final Environmental Assessment
FEIS	Final Environmental Impact Statement
FLPMA	Federal Land Policy Management Act of 1976
FR	Federal Register
ft	feet, foot
ft/day	feet per day
ft/mile	feet per mile
GAGMO	Gillette Area Ground Water Monitoring Organization
GNP	Gross National Product
gpm	gallons per minute
GSP	Gross State Product
IMPROVE	Interagency Monitoring of Protected Environments
Km	kilometers
Kv	kilovolts
LAC	limits of acceptable change (re: air quality)

Abbreviations and Acronyms Used in this Report

LBA	lease by application
lbs/mmBtu	pounds per million British thermal units
LFC	Liquids From Coal
LRMP	Land and Resource Management Plan
MBHFI	migratory birds of high federal interest
$\mu g/m^3$	micrograms per cubic meter
$\mu eq/L$	microequivalents per liter
mg/L	milligrams per liter
mi	mile
MLA	Mineral Leasing Act of 1920
mmbcy	million bank cubic yards
mmtpy	million tons per year
mph	miles per hour
Mw	megawatts
NAAQS	National Ambient Air Quality Standards
NAPG	North American Power Group
NEPA	National Environmental Policy Act of 1969
NO_x	nitrogen oxides
NRHP	National Register of Historic Places
O_3	photochemical oxidants
OC	organic carbon particles
OSM	Office of Surface Mining Reclamation & Enforcement
P.M.	Prime Meridian
PM_{10}	particulates finer than 10 microns
PMT	postmining topography
PP&L	Pacific Power and Light Company
PRB	Powder River Basin
PRBRC	Powder River Basin Resource Council
PRCC	Powder River Coal Company
PRRCT	Powder River Regional Coal Team
PSD	prevention of significant deterioration
R2P2	Resource Recovery and Protection Plan
RMP	Resource Management Plan
ROD	Record of Decision
ROW	Right-of-Way
SARA	Superfund Amendment & Reauthorization Act of 1986
SEO	State Engineers Office
SHPO	State Historic Preservation Office
SMCRA	Surface Mining Control and Reclamation Act of 1977
SO_2	sulfur dioxide
T&E	threatened and endangered
TBNG	Thunder Basin National Grassland
TDS	total dissolved solids
TSP	total suspended particulates
U.S.	United States
USC, U.S.C.	United States Code
USDI	U.S. Department of the Interior
USFS	U.S. Forest Service
USGS	U.S. Geological Survey

Abbreviations and Acronyms Used in this Report

USFWS	U.S. Fish and Wildlife Service
VRM	visual resource management
WCIC	Wyoming Coal Information Committee
WDEQ	Wyoming Department of Environmental Quality
WDEQ/AQD	Wyoming Department of Environmental Quality/Air Quality Division
WDEQ/LQD	Wyoming Department of Environmental Quality/Land Quality Division
WGFD	Wyoming Game and Fish Department
WOC	Wyoming Outdoor Council

1.0 INTRODUCTION

On February 14, 1997, ACC[1] filed an application with the BLM for federal coal reserves located north of and adjacent to the Antelope Mine in Converse County, Wyoming. The application area is located in southern Campbell County and northern Converse County, Wyoming, approximately 20 miles southeast of Wright, Wyoming (Figure 1-1). The federal coal reserves were applied for as a maintenance tract for the Antelope Mine under the regulations at 43 CFR 3425, Leasing On Application. The Antelope Mine is operated by ACC, a subsidiary of the Kennecott Energy Company.

ACC's coal lease application, which was assigned case file number WYW141435, was reviewed by the BLM Wyoming State Office Division of Mineral and Lands Authorization. They determined that it met the regulatory requirements for a lease by application or LBA. The tract is referred to as the Horse Creek LBA Tract.

The Horse Creek LBA Tract is located within the Powder River Federal Coal Region, which was decertified in January 1990. Although the Powder River Federal Coal Region is decertified, the PRRCT, a federal/state advisory board established to develop recommendations concerning management of federal coal in the region, has continued to meet regularly and review all federal lease applications in the region. The PRRCT reviewed the Horse Creek application at their April 23, 1997 public meeting in Casper, Wyoming, and recommended that the BLM process the Horse Creek federal coal lease application as an LBA.

On May 1, 1998, ACC filed an application with the BLM to modify the Horse Creek LBA Tract configuration. BLM reviewed the modified tract configuration, and notified the members of the PRRCT by letter in July of 1998.

In order to process an LBA, the BLM must evaluate the quantity, quality, maximum economic recovery, and fair market value of the federal coal and fulfill the requirements of NEPA by evaluating the environmental impacts of leasing and mining the federal coal. This EIS has been prepared to evaluate the site-specific and cumulative environmental impacts of leasing and developing the federal coal included in the application area. Scoping for the Horse Creek lease application was initially conducted from November 1 to November 30, 1997, and a public scoping meeting was held in Gillette, Wyoming on November 13, 1997. After BLM received the application to modify the lease application area, BLM requested additional scoping comments on the modified Horse Creek LBA Tract. The second scoping period was from June 18 through July 24, 1998.

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[1] Refer to page viii for a list of abbreviations and acronyms used in this document.

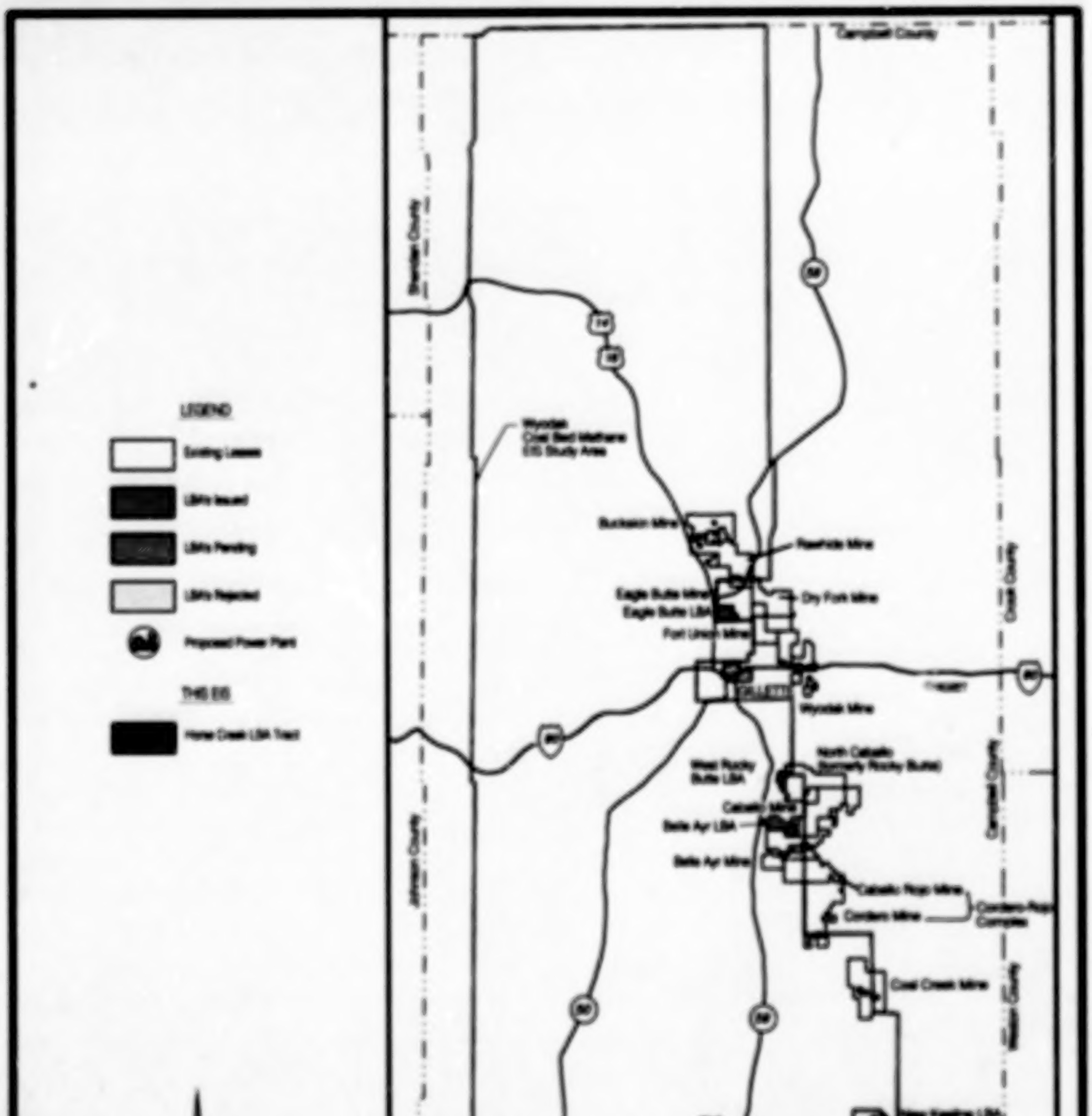

Figure 1-1. General Location Map with Federal Coal Leases, LBA's, and Wyodak Coal Bed Methane EIS Study Area.

BLM will use the analysis in this EIS to decide whether or not to hold a public, competitive, sealed-bid coal lease sale for the coal tract and issue a federal coal lease. If the sale is held, the bidding at the sale is open to any qualified bidder; it is not limited to the applicant. If the lease sale is held, a lease will be issued to the highest bidder at the sale if a federal sale panel determines that the high bid meets or exceeds the fair market value of the coal as determined by BLM's economic evaluation and if the U.S. Department of Justice determines that there would be no antitrust violations if a lease is issued to the high bidder.

Since decertification of the Powder River Federal Coal Region, nine federal coal leases have been issued in the Wyoming portion of the Powder River Federal Coal Region (Table 1-1). One of these leases was issued to ACC after they submitted the successful bid for a maintenance tract also adjacent to the Antelope Mine on December 4, 1996 (Figure 1-1 and Table 1-1). Four additional applications, including the Horse Creek application, are currently pending or have been rejected (Table 1-2).

Other agencies, including OSM, a cooperating agency on this EIS, will use this analysis to make decisions related to leasing and mining the federal coal in this tract.

The Horse Creek LBA Tract as applied for and the existing federal coal leases in the adjacent Antelope Mine are shown in Figure 1-2. As applied for, the Horse Creek LBA Tract includes approximately 2,838 acres and an estimated 357 million tons of in-place coal reserves. Not all of the coal included in the tract is mineable, however. For example, some of the coal included in the tract is located within the BN & UP railroad right-of-way. This coal will not be mined because it has been determined to be unsuitable for mining according to the coal leasing unsuitability criteria (43 CFR 3461), but it was included in the tract to allow maximum recovery of the mineable reserves adjacent to the right-of-way. ACC estimates that approximately 264.5 million tons of mineable coal reserves are included in the Horse Creek LBA Tract as applied for.

If ACC acquires a federal coal lease for these lands, the coal will be mined, processed, and distributed as part of ACC's permitted Antelope Mine. The Horse Creek LBA Tract is contiguous with the Antelope Mine. The area applied for is substantially similar to the adjacent mine for which detailed site-specific environmental data have been collected and for which environmental analyses have previously been prepared to secure the existing leases and the necessary mining permits.

The surface of the Horse Creek LBA Tract is owned by ACC, Powder River Coal Company and Jerry and Barbara Dilts.

As applied for, the Horse Creek LBA Tract coal resources would be mined as a maintenance tract to extend

Table 1-1. LBA's Sold, Powder River Basin, Wyoming

LBA/ Lease #/ Applicant (Mine)	Application Date Effective Date	Acres*	Mineable Tons of Coal*	Successful Bid	Successful Bidder (Mine)
Jacobs Ranch WYW117924 Jacobs Ranch	10/10/89 10/1/92	1708.620	147,423,560	$20,114,930.00	Jacobs Ranch
West Black Thunder WYW118907 Black Thunder	12/22/89 10/1/92	3,492.495	429,048,216	$71,909,282.69	Black Thunder
N. Antelope/ Rochelle WYW119554 N. Antelope/ Rochelle	3/2/90 10/1/92	3,064.040	403,500,000	$86,987,765.00	North Antelope/ Rochelle
West Rocky Butte WYW122586	12/4/90 1/1/93	463.205	56,700,000	$16,500,000.00	Rocky Butte
Eagle Butte WYW124783 Eagle Butte	7/25/98 8/1/95	1059.175	166,364,000	$18,470,400.00	Eagle Butte
Antelope WYW128322 Antelope	1/29/92 2/1/97	617.20	60,364,000	$9,054,600.00	Antelope
North Rochelle WYW127221 North Rochelle	7/22/92 1/1/98	1,481.930	157,610,000	$30,576,340.00	North Rochelle
Powder River WYW136142 N.Antelope/ Rochelle	3/23/95 9/1/98	4,224.225	532,000,000	$109,596,500.00	North Antelope/ Rochelle
Thundercloud WYW136458 Jacobs Ranch	4/14/95 1/1/99	3,545.503	412,000,000	$158,000,008.50	Black Thunder
TOTALS		**19,656.393**	**2,365,009,776**	**$521,209,826.19**	

***Information from Sale Notice**

Table 1-2. Pending & Rejected LBA's and Lease Exchanges, Powder River Basin, Wyoming

LBA/ Lease#/ Applicant (Mine)	**Application Date**	**Acres***	**Mineable Tons of Coal***	**Status**
PENDING LBA's				
Horse Creek/ WYW141435/ Antelope	2/14/97	2,837.91	356,500,000	EIS in Preparation
Belle Ayr/ WYW141568/ Belle Ayr	3/20/97	1,579.00	200,000,000	PRRCT Reviewed on 4/23/97; Recommended that BLM Process
N. Jacobs Ranch**/ WYW146744/ Jacobs Ranch	10/2/98	4,821.00	519,000,000	PRRCT Reviewed on 2/23/99; Recommended that BLM Process
TOTAL PENDING		9,237.91	1,075,500,000	
REJECTED LBA				
New Keeline**/ WYW138975 Evergreen Enterprises (New Mine Start)	5/13/96	7,841.00	675,000,000	Rejected by BLM; Decision Under Appeal

*Information taken from application

**These two lease application areas partially overlap one another

LEASE EXCHANGE

Lease Exchange	Exchange Type	Acres Offered	Estimated Mineable Tons of Coal Offered	Status
ENRON (Belco) Original Lease WYW 0322794	I-90 (Public Law 95-554)	599.17	106,000,000	Draft EA to Public 7/26/99

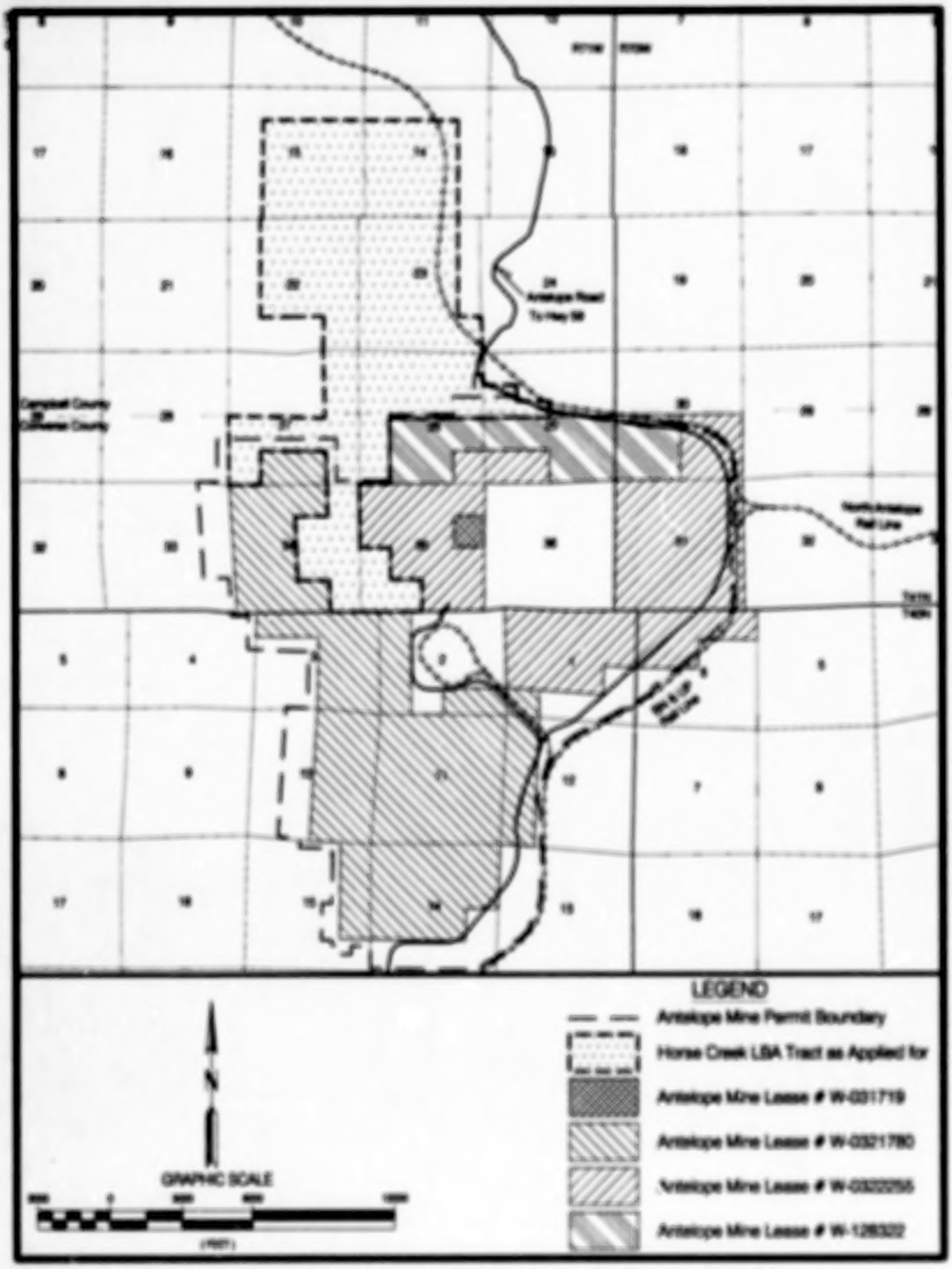
Antelope Road
To Hwy 59
Campbell County
Converse County
North Antelope
Rail Line
N
GRAPHIC SCALE
(FEET)
LEGEND
Antelope Mine Permit Boundary
Horse Creek LBA Tract as Applied for
Antelope Mine Lease # W-031719
Antelope Mine Lease # W-0321780
Antelope Mine Lease # W-0322255
Antelope Mine Lease # W-128322

Figure 1-2. Antelope Mine Federal Coal Leases and Horse Creek LBA Tract as Applied for.

mine life at the Antelope Mine. The mining method would be a combination of truck and shovel and dragline, which are the mining BLM will use the analysis in this EIS to decide whether or not to hold a public, competitive, sealed-bid coal methods currently in use at this mine.

After mining, the land would be reclaimed for livestock grazing and wildlife use as is the current practice at the Antelope Mine.

1.1 Purpose and Need for Action

BLM administers the federal coal leasing program under the Mineral Leasing Act of 1920. A federal coal lease grants the lessee the exclusive right to obtain a mining permit for, and to mine coal on, the leased tract subject to the terms of the lease, the mining permit, and applicable state and federal laws. In return for receiving a lease, a lessee must make a bonus payment to the federal government when the coal is leased, make annual rental payments to the federal government, and make royalty payments to the federal government when the coal is mined. Federal bonus, rental and royalty payments are equally divided with the state in which the lease is located.

The Antelope Mine, as permitted, includes 7,683 acres and originally contained approximately 462.5 million tons of mineable coal. As of January 1, 1999, ACC had an estimated 198 million tons of mineable coal reserves remaining at the mine, and the company estimates that approximately 184 million tons of those remaining reserves are recoverable. ACC has an air quality permit approved by WDEQ/AQD to mine up to 30 million tons of coal per year, however, the mine produced approximately 19.4 million tons of coal in 1998. ACC estimates that, under their current mine plan, the existing recoverable reserves at the Antelope Mine will be depleted within 8 years. The company has applied for the coal reserves in the Horse Creek LBA Tract to extend the life of the Antelope Mine. The mineable coal resources included in the LBA tract as applied for would allow the Antelope Mine to operate for approximately eight additional years at a mining rate of 30 mmtpy. If the LBA tract is leased to ACC as a maintenance tract, the permit area for the adjacent mine would have to be amended to include the new lease area before it can be disturbed. This process takes several years to complete. ACC is applying for federal coal reserves now so that they can negotiate new contracts and then complete the permitting process in time to meet anticipated new contract requirements.

This EIS analyzes the environmental impacts of issuing a federal coal lease and mining the federal coal in the Horse Creek lease application as required by NEPA and associated rules and guidelines. The decision to hold a competitive sale and issue a lease for the lands in this application is a prerequisite for mining the Horse Creek LBA Tract but is not in itself the enabling action that will allow mining, as discussed above. The most detailed analysis occurs after a lease has been issued but prior to mine development, when the lessee files a permit application package with the WDEQ/LQD and OSM for a surface mining permit and approval of the federal mining plan. Authorities and responsibilities of the BLM and other concerned regulatory agencies are described in the following sections.

1.2 Regulatory Authority and Responsibility

The ACC coal lease application was submitted and will be processed and evaluated under the following authorities:

- MLA, as amended;
- the Multiple-Use Sustained Yield Act of 1960;
- NEPA;
- FCLAA;
- FLPMA; and
- SMCRA.

The BLM is the lead agency responsible for leasing federal coal lands under the MLA as amended by FCLAA and is also responsible for preparation of this EIS to evaluate the potential environmental impacts of issuing a coal lease. For the Horse Creek application, the BLM must decide whether to hold a competitive, sealed-bid lease sale for the tract as applied for, hold a competitive sealed bid lease sale for a modified tract, or reject the lease application and not offer the tract for sale.

The Horse Creek LBA Tract is located within the area covered by the *Medicine Bow National Forest and Thunder Basin National Grassland Land and Resource Management Plan* (USFS, 1985) and some of the lands included in the tract were formerly managed by the USFS; however, as a result of a recent land exchange, there are currently no federal surface lands managed by the USFS included in the Horse Creek LBA Tract. As a result, the USFS is not a cooperating agency on this EIS and USFS consent will not be required if a lease sale is held. (See Section 1-4 of this EIS for additional discussion of the former USFS lands included in the tract.)

OSM is a cooperating agency on this EIS. After a coal lease is issued, SMCRA gives OSM primary responsibility to administer programs that regulate surface coal mining operations and the surface effects of underground coal mining operations. Pursuant to Section 503 of SMCRA, the WDEQ developed, and in November 1980 the Secretary of the Interior approved, a permanent program authorizing WDEQ to regulate surface coal mining operations and surface effects of underground mining on nonfederal lands within the state of Wyoming. In January 1987, pursuant to Section 523(c) of SMCRA, WDEQ entered into a cooperative agreement with the Secretary of the Interior authorizing WDEQ to regulate surface coal mining operations and surface effects of underground mining on federal lands within the state.

Pursuant to the cooperative agreement, a federal coal lease holder in Wyoming must submit a permit application package to OSM and WDEQ/LQD for any proposed coal mining and reclamation operations on federal lands in the state. WDEQ/LQD reviews the permit application package to insure the permit application complies with the permitting requirements and the coal mining operation will meet the performance standards of the approved Wyoming program. OSM, BLM, and other federal agencies review the permit application package to insure it complies with the terms of the coal lease, the MLA, NEPA, and other federal laws and their attendant regulations. If the permit application package does comply, WDEQ issues the applicant a permit to conduct coal mining operations. OSM recommends approval, approval with conditions, or disapproval of the federal mining plan to the Assistant Secretary of the Interior, Land and Minerals Management. Before the federal mining plan can be approved, the BLM must concur with this recommendation.

If the proposed LBA tract is leased to an existing mine, the lessee would be required to revise their coal mining permit prior to mining the coal, following the processes outlined above. As a part of that process, a new mining and reclamation plan would be developed showing how the lands in the LBA tract would be mined and reclaimed. Specific impacts which would occur during the mining and reclamation of the LBA tract would be addressed in the mining and reclamation plans, and specific mitigation measures for anticipated impacts would be described in detail at that time.

WDEQ enforces the performance standards and permit requirements for reclamation during a mine's operation and has primary authority in environmental emergencies. OSM retains oversight responsibility for this enforcement. BLM has authority in those emergency situations where WDEQ or OSM cannot act before environmental harm and damage occurs.

BLM also has the responsibility to consult with and obtain the comments of other state or federal agencies which have jurisdiction by law or special expertise with respect to potential environmental impacts. Appendix A presents other federal and state permitting requirements that must be satisfied to mine this LBA tract.

1.3 Relationship to BLM Policies, Plans, and Programs

In addition to the federal acts listed under Section 1.2, guidance and regulations for managing and administering public lands, including the federal coal lands in the ACC application, are set forth in 40 CFR 1500 (Protection of Environment), 43 CFR 1601 (Planning, Programming, Budgeting), and 43 CFR 3400 (Coal Management).

Specific guidance for processing applications follow BLM Manual 3420 (Competitive Coal Leasing, BLM 1989) and the 1991 *Powder River Regional Coal Team Operational Guidelines For*

Coal Lease-By-Applications (BLM 1991). The *National Environmental Policy Act Handbook* (BLM 1988) has been followed in developing this EIS.

1.4 Conformance with Existing Land Use Plans

FCLAA requires that lands considered for leasing be included in a comprehensive land use plan and that leasing decisions be compatible with that plan. The RMP for the BLM Buffalo Resource Area (BLM 1985a) governs and addresses the leasing of federal coal in Campbell County and the Platte River Resource Area RMP and its associated EIS (BLM 1985b) is the plan which governs the management of BLM-administered lands and minerals in Converse County. *The Medicine Bow National Forest and Thunder Basin National Grassland Land and Resource Management Plan* (LRMP) (USFS 1985) governs and addresses the management of USFS (public) lands in the area. There are currently no USFS-administered lands on the Horse Creek LBA Tract. However, portions of the tract were formerly part of the TBNG and were included in the LLCLE (Fiddleback Ranch) Land Exchange. These lands were part of the TBNG in 1985 when the LRMP (USFS 1985) was prepared. Therefore, management decisions concerning these respective lands must comply with the BLM RMP's, but general guidance for these decisions may also be obtained from the LRMP.

Coal land use planning involves four planning screens to determine whether the subject coal is acceptable for further lease consideration. The four coal screens are:

- development potential of the coal lands;
- unsuitability criteria application;
- multiple land use decisions that eliminate federal coal deposits; and
- surface owner consultation.

Only those federal coal lands that pass these screens are given further consideration for leasing.

For the RMP's, only in-place coal with beds at least five ft thick, stripping ratios of 15:1 or less, and less than 500 ft of overburden were addressed and carried forward. The lands in this coal lease application pass this test and were generally addressed in the BLM RMP's, although the Horse Creek Tract was not specifically covered. The TBNG formerly included lands in the Horse Creek LBA Tract, and the 1985 LRMP did contain findings specific to the Horse Creek Tract and nearby areas.

The coal leasing unsuitability criteria listed in the federal coal management regulations (43 CFR 3461) have been applied to high to moderate coal potential lands in the BLM resource areas. Appendix B of this EIS summarizes the unsuitability criteria, describes the general findings for the Buffalo and Platte River RMP's and the LRMP and presents a validation of these findings for the Horse Creek Tract.

As indicated in Appendix B, the lands in the Horse Creek LBA Tract within the BN & UP railroad ROW are unsuitable for mining under Unsuitability Criterion Number 2. These lands are included in the LBA tract to allow recovery of all of the mineable coal outside of the rights-of-way and associated buffer zones and to comply with the coal leasing regulations which do not allow leasing of less than 10-acre aliquot parts. A stipulation stating that the portion of the lease within the BN & UP ROW cannot be mined will be added if a lease is issued. The exclusion of the coal underlying the ROW from mining activity by lease stipulation honors the finding of unsuitability for mining under Unsuitability Criterion Number 2 for the BN & UP ROW.

Surface owner consultation was completed during preparation of the 1985 LRMP, and qualified private surface owners[2] with land over federal coal were provided the opportunity to have their views considered by the USFS during land use planning. A portion of the lands in this application were a part of the TBNG in 1985 and were addressed in the LRMP and carried forward as acceptable for further lease consideration based on satisfactory surface owner consultations at that time. Based on updated surface ownership provided by ACC, the surface on the Horse Creek LBA Tract is owned by the ACC, Powder River Coal Company and Jerry and Barbara Dilts. All lands in the tract that were federally owned when the LRMP was prepared were determined acceptable for further lease consideration. If a lease sale is held, BLM will review the current surface ownership in the tract, and any private surface owners who are determined to be qualified will be consulted prior to the sale.

As part of the coal planning for the LRMP and Buffalo and Platte River RMP's, a multiple land use conflict analysis was completed to identify and "eliminate additional coal deposits from further consideration for leasing to protect resource values of a locally important or unique nature not included in the unsuitability criteria," in accordance with 43 CFR 3420.1-4e(3). The multiple use conflict evaluation in the Buffalo RMP identified approximately 221,000 acres within Campbell, Converse, and Johnson counties that were potentially affected by multiple use conflicts in four categories (producing oil and gas fields, communities, recreation and public purpose facilities, and cultural resources). None of the multiple use conflict areas identified in the Buffalo RMP are included in the Horse Creek LBA Tract. All of the lands in the application area were subjected to this multiple use conflict analysis and determined to be acceptable for further lease consideration (USFS 1985).

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[2] The natural person or persons (for corporation, the majority stock of which is held by a person or persons) who 1) hold legal or equitable title to the land surface, 2) have their principal place of residence on the land or personally conduct farming or ranching operations upon a farm or ranch unit to be affected by surface mining operations, or receive directly a significant portion of their income, if any, from such farming or ranching operations, and 3) have met the conditions of 1 and 2 for a period of a least 3 years prior to granting of any consent to mining of their lands.

In summary, all of the lands in the ACC coal lease application have been subjected to the four coal planning screens and determined acceptable for further lease consideration. Thus, a decision to lease the federal coal lands in this application would be in conformance with the BLM Buffalo Resource Area and Platte River Resource Area RMP's, and also with the USFS LRMP.

1.5 Consultation and Coordination

Initial Involvement

BLM received the Horse Creek coal lease application on February 14, 1996. The application was initially reviewed by the BLM, Wyoming State Office, Division of Mineral and Lands Authorization. The BLM ruled that the application and lands involved met the requirements of regulations governing coal leasing on application (43 CFR 3425).

The BLM Wyoming State Director notified the Governor of Wyoming on February 26, 1997, that 'ACC had filed a lease application with BLM for the Horse Creek LBA Tract. A notice announcing the receipt of the ACC coal lease application was published in the *Federal Register* on March 18, 1997. Copies were sent to voting and nonvoting members of the PRRCT, including the governors of Wyoming and Montana, the Northern Cheyenne Tribe, the Crow Tribal Council, the USFS, OSM, USFWS, National Park Service, and USGS.

The lease application was reviewed by the PRRCT at their April 23, 1997 public meeting in Casper, Wyoming, at which time ACC presented information about their existing mine and pending lease application to the PRRCT. The PRRCT recommended that BLM process the coal lease application as an LBA. The major steps in processing an LBA are shown in Appendix C.

The BLM filed a Notice of Scoping in the *Federal Register* on October 31, 1997. The filing served as notice that the ACC coal lease application had been received and public comment was requested.

A public scoping meeting was held on November 13, 1997 in Gillette, Wyoming. At the public meeting, ACC personnel orally presented information about their mine and their need for the coal. The presentation was followed by a question and answer period, during which several oral comments were made. The scoping period extended from November 1 through November 30, 1997, during which time BLM received eight written comments. As a result of the application by ACC to modify the size of the Horse Creek LBA Tract, a second scoping period was conducted from June 18 through July 24, 1998. A notice of intent to prepare an EIS and notice of additional scoping was published in the *Federal Register* on June 18, 1998. The members of the PRRCT were notified of the application to modify the size of the tract by letter in July 1998. A total of 13 written comment letters were received from nine entities during the two scoping periods. (Several commentors restated their initial comments during the second comment period).

Chapter 5.0 provides a list of other federal, state, and local governmental agencies that were consulted in preparation of this EIS (Table 5-1) and the distribution list for this DEIS (Table 5-3).

Issues and Concerns

Issues and concerns expressed by the public and government agencies relating to the ACC coal lease application included:

- cumulative impacts on air quality;
- cumulative impacts on wildlife;
- impacts on endangered species;
- impacts on raptors;
- potential impacts on cultural and paleontological resources;
- wetland impacts;
- water quality impacts and effects on fisheries, migratory birds, and threatened or endangered species;
- short- and long-term impacts on fish and wildlife;
- impacts to surface and groundwater quantity and quality;
- acreage disturbed vs. acreage reclaimed;
- impacts on public access for recreational use and wildlife-related recreation;
- impacts on Native American cultural resources;
- impacts on existing oil and gas wells and gas-gathering systems;
- impacts to existing oil and gas rights in the lease application area;
- loss of natural resources, and
- impacts on agricultural producers, the agriculture industry, and the overall economy of the area.

Draft EIS

Parties on the distribution list are being sent copies of the DEIS, and copies are being made available for review at the BLM offices in Casper and Cheyenne. A notice announcing the availability of the DEIS will be published in the *Federal Register* by the EPA. The BLM will publish a Notice of Availability/Notice of Public Hearing in the *Federal Register*. The 60-day comment period on the DEIS will commence with publication of the Notice of Availability. The BLM *Federal Register* notice will announce the date and time of the public hearing and solicit public comments on the DEIS and on the fair market value, the maximum economic recovery, and the proposed competitive sale of coal from the LBA tract. A formal public hearing will be held.

Final EIS and Future Involvement

All comments received on the DEIS will be included, with agency responses, in the FEIS. Availability of the FEIS will be published in the

Federal Register by the BLM and the EPA. After a 30-day availability period, BLM will make a separate decision to hold or not to hold a competitive lease sale and issue a lease for the federal coal for this tract. A public ROD for the tract will be mailed to parties on the mailing list and others who commented on this LBA during the NEPA process. The public and/or the applicant can appeal the BLM decision to hold or not to hold a competitive sale and issue a lease for the tract. The BLM decision must be appealed within 30 days after it is signed. The decision can be implemented at that time if no appeal is received. If a competitive lease sale is held, the lease sale will follow the procedures set forth in 43 CFR 3422, 43 CFR 3425, and BLM Handbook H-3420-1 (Competitive Coal Leasing).

Department of Justice Consultation

After the competitive coal lease sale, but prior to issuance of the lease, the BLM will solicit the opinion of the Department of Justice on whether the planned lease issuance creates a situation inconsistent with federal anti-trust laws. The Department of Justice is allowed 30 days to make this determination. If the Attorney General has not responded in writing within the 30 days, the BLM can proceed with issuance of the lease.

2.0 PROPOSED ACTION AND ALTERNATIVES

This chapter describes the Proposed Action and alternatives to this action. The Proposed Action is to hold a competitive lease sale for the federal coal lands in the Horse Creek LBA Tract as applied for by ACC[1]. Under this alternative, it is assumed that the tract would be developed as a maintenance tract for an existing mine. The No Action Alternative (Alternative 1) is to reject the application and not hold a lease sale for these federal coal lands. Other alternatives considered include:

- holding a competitive lease sale for federal coal lands in the Horse Creek LBA as modified by the BLM, with the assumption that it would be developed as a maintenance tract for an existing mine (Alternative 2);
- holding a competitive lease sale for federal coal lands in the Horse Creek LBA Tract (as applied for or as modified by BLM), with the assumption that it would be developed as a new mine (Alternative 3); and
- Postponing the coal lease sale for the Horse Creek LBA Tract.

The Horse Creek LBA Tract as applied for (Proposed Action) and as amended by BLM (Alternative 2) are shown in Figure 2-1.

LBA tracts are nominated for leasing by companies with an interest in acquiring them, but as discussed in Chapter 1, the LBA process is, by law and regulation, an open, public, competitive sealed-bid process. If the decision reached after this EIS is completed is to hold a lease sale, the applicant (ACC) may not be the high bidder. The Proposed Action and Alternative 2 considered in this EIS assume that ACC would be the successful bidder if a competitive sale is held, and that the Horse Creek LBA Tract would be mined as a maintenance tract for the permitted Antelope Mine. Alternative 3 assumes that ACC would not be the successful bidder if a competitive sale is held, and that the Horse Creek LBA Tract would be developed as a new mine.

If a decision is made to hold a competitive lease sale and there is a successful bidder, a detailed mining and reclamation plan must be developed by the successful bidder and approved before mining can begin on the tract. As part of the approval process, the mining and reclamation plan would undergo detailed review by state and federal agencies. This plan would potentially differ from the plan used to analyze the impacts of the Proposed Action and Alternative 2 in this EIS, but the differences would not be expected to significantly change the impacts

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[1] Refer to page vii for a list of abbreviations and acronyms used in this document.

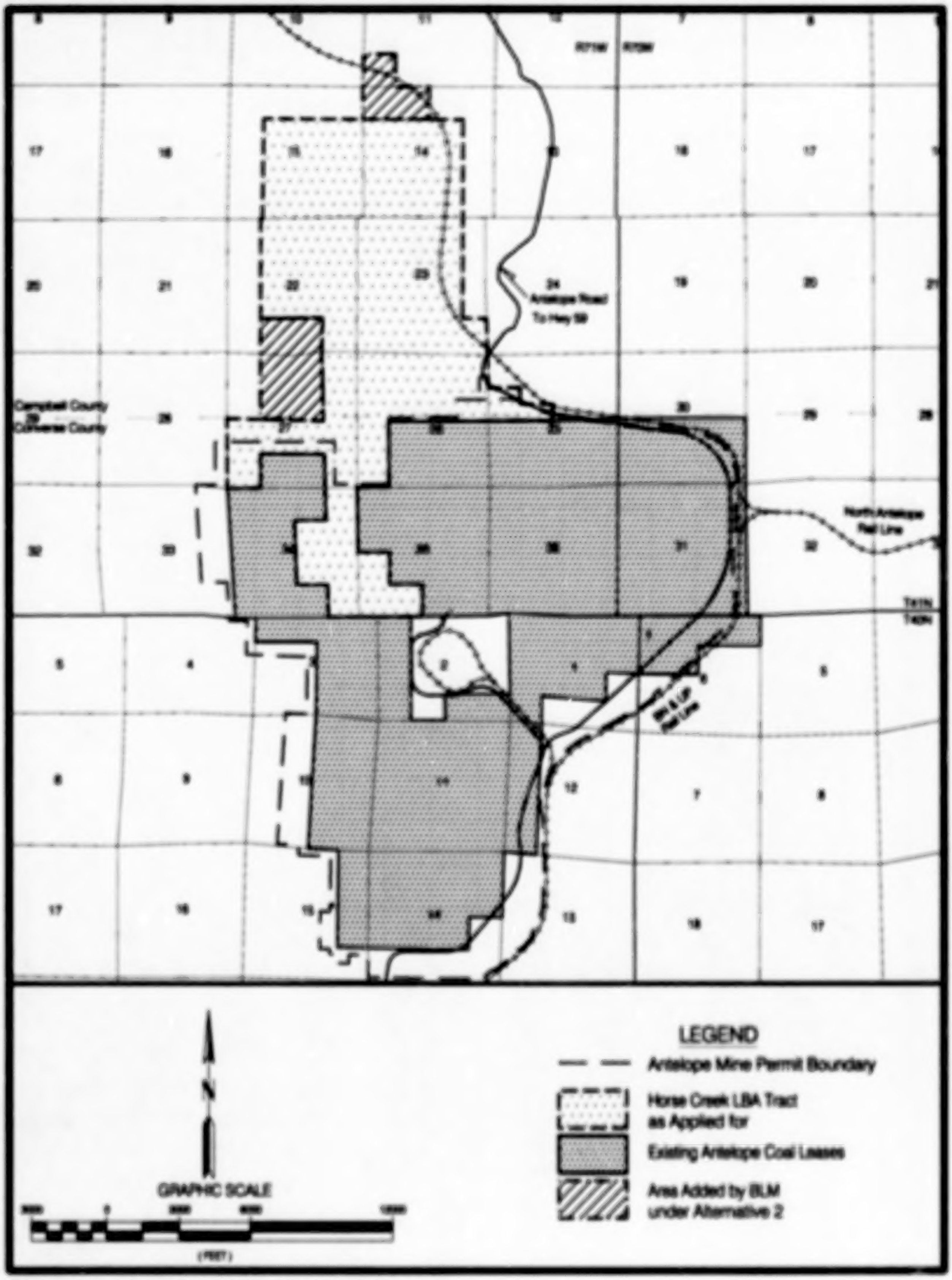

Figure 2-1. Horse Creek LBA Tract Configurations.

described here. These differences would typically be related to the details of mining and reclaiming the tract but major factors like tons of coal mined, yards of overburden removed, acres disturbed, etc. would not be significantly different from the plan used in this analysis.

2.1 Proposed Action

Under the proposed action, the Horse Creek LBA Tract, as applied for by ACC, would be offered for lease at a competitive sale, subject to standard and special lease stipulations developed for the PRB (Appendix D). The boundaries of the tract would be consistent with the tract configurations proposed in the Horse Creek LBA Tract lease application (see Figure 2-1). The proposed action assumes that ACC will be the successful bidder on the Horse Creek Tract if it is offered for sale.

The legal description of the proposed Horse Creek LBA Tract coal lease lands as applied for by ACC under the Proposed Action is as follows:

T.41N., R.71W., 6th P.M., Campbell County and Converse County, Wyoming

Section 14: Lots 5 through 7 and 10 through 15; 358.85 acres
Section 15: Lots 6 through 11 and 14 through 16; 371.58 acres
Section 22: Lots 1, 3 through 6 and 9 through 13; 421.70 acres
Section 23: Lots 2 through 7 and 10 through 16; 528.64 acres
Section 25: Lots 11 and 12 (S ½); 59.44 acres
Section 26: Lots 1 through 8, 12 and 13; 402.68 acres
Section 27: Lots 1 through 3, 5, 12 through 14 and 16; 334.85 acres
Section 34: Lots 1, 7, 8 through 10 and 16; 242.84 acres
Section 35: Lots 8 through 10; 117.33 acres

Total surface area applied for: 2,837.91 acres

Land descriptions and acreage are based on the BLM Status of Public Domain Land and Mineral Title approved Coal Plat as of December 19, 1996.

As indicated in Chapter 1, Section 1.4, some of the above described lands are unsuitable for mining due to the presence of the BN & UP railroad ROW. Although these lands would not be mined, they are included in the tract to allow recovery of all the mineable coal outside of the ROW and to comply with the coal leasing regulations, which do not allow leasing of less than 10 acre aliquot parts. ACC's approved mining plan avoids disturbing the Antelope Creek valley, so any coal resources included in the above-described lands that are beneath Antelope Creek would not be recovered. ACC estimates that the tract as applied for includes approximately 2,041 mineable acres with approximately 264.5 million tons of mineable coal, and that about 246 million tons of that coal would be recoverable. BLM will independently evaluate the volume and average quality of the coal resources included in the tract as part of the fair market value determination process. BLM's estimate of the mineable reserves and average quality of the coal included in the tract will be published in the sale notice if the tract is offered for sale. Some coal quality information in the area of the Horse Creek LBA Tract is included in Section 3.3 of this document.

The Horse Creek LBA Tract would be mined as an integral part of the Antelope Mine under the Proposed Action. The Antelope Mine is already operating under an approved mining permit. The permit would require amendment to include the LBA tract. Since the Horse Creek LBA Tract would be an extension of the existing Antelope Mine, the facilities and infrastructure would be the same as those identified in the WDEQ/LQD Mine Permit 525 Term T6 approved October 29, 1998 for the Antelope Mine and the BLM Resource Recovery and Protection Plan approved October 28, 1997 for the Antelope Mine.

ACC has an air quality permit from WDEQ/AQD to mine up to 30 million tons of coal per year at the Antelope Mine. In 1998, the Antelope Mine produced 19.4 million tons (Wyoming State Inspector of Mines 1999). The Horse Creek LBA Tract will extend the life of this existing mine, allowing it to achieve and maintain the permitted coal production level of 30 million tons per year.

If ACC acquires the Horse Creek LBA Tract as applied for, they estimate that a total of 429.7 million tons of coal would be mined after 1998, with an estimated 246.0 million tons coming from the LBA tract. This estimate of recoverable reserves excludes the coal that would not be recovered beneath the BN & UP ROW and Antelope Creek, and assumes that about five percent of the coal would be lost under normal mining practices, based on historical recovery factors at the Antelope Mine. A total estimated 1302.8 million bank cubic yards of overburden would be excavated after 1998, of which 410 million cubic yards are in the current permit area and 892.8 million cubic yards are in the Horse Creek Tract. As of December 31, 1998, 99.9 million tons of coal and 209.6 million bank cubic yards of overburden had been excavated from within the current permitted area of the mine.

Topsoil removal with heavy equipment, using a combination of company-owned and contractor equipment, would proceed ahead of overburden removal. Whenever possible, direct haulage to a reclamation area would be done, but due to scheduling some topsoil would be temporarily stockpiled. As required by the reclamation plan, heavy equipment again will be used to haul and distribute the stockpiled topsoil. Trucks and shovels and draglines would remove overburden in all areas. Most overburden and all coal would be drilled and blasted to facilitate efficient excavation. As overburden is removed, most would be directly placed into areas where coal has already been removed. Elevations consistent with an approved PMT plan will be established as quickly as possible. Under certain conditions, the PMT may not be immediately achievable. This would occur when there is an excess of material which may require temporary stockpiling; when there is insufficient material available from current overburden removal operations; or when future mining could redisturb an area already mined.

Coal production would occur from two seams (Anderson and Canyon) at several working faces to enable blending of the coal to meet customer quality requirements, to comply with BLM lease requirements for maximum economic recovery of the coal resource, and to optimize coal removal efficiency with available equipment. Mining efficiency and air quality protection would be facilitated by extensive use of near-pit crushers and overland conveyors from the crushers to the storage and loadout facilities.

Current employment at the Antelope Mine is 180. If the LBA tract is acquired, ACC anticipates that production would increase to 30 mmtpy, with employment increasing to 250 persons.

Hazardous and Solid Waste

Solid waste which is produced at the existing Antelope Mine consists of floor sweepings, shop rags, lubricant containers, welding rod ends, metal shavings, worn tires, packing material, used filters, and office and food wastes. Antelope Mine disposes of its solid wastes within its permit boundary in accordance with WDEQ-approved solid waste disposal plans. Sewage generated by mining is handled by WDEQ-permitted sewage systems present on the existing mine facilities. Maintenance and lubrication of most of the equipment takes place at existing shop facilities at the Antelope Mine.

Major lubrication, oil changes, etc., of most equipment are performed inside the service building lube bays, where waste oil is currently contained and deposited in storage tanks. The collected waste oils are then recycled offsite. These practices would not change if ACC acquires the Horse Creek Tract.

ACC has reviewed the EPA's *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act* (SARA) *of 1986* (as amended) and EPA's *List of Extremely Hazardous Substances* as defined in 40 CFR 355 (as amended) for hazardous substances used at the Antelope Mine. ACC maintains files containing Material Safety Data Sheets for all chemicals, compounds and/or substances which are or would be used during the course of mining.

ACC is responsible for ensuring that all production, use, storage, transport, and disposal of hazardous and extremely hazardous materials as a result of mining are in accordance with all applicable existing or hereafter promulgated federal, state, and local government rules, regulations, and guidelines. All mining activities involving the production, use, and/or disposal of hazardous or extremely hazardous materials are and would continue to be conducted so as to minimize potential environmental impacts.

ACC must comply with emergency reporting requirements for releases of hazardous materials. Any release of hazardous or extremely hazardous substances in excess of the reportable quantity, as established in 40 CFR 117, is reported as required by the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), as amended. The materials for which such notification must be given are the extremely hazardous substances listed in Section 302 of the *Emergency Planning and Community Right to Know Act* and the hazardous substances designated under Section 102 of CERCLA, as amended. If a reportable quantity of a hazardous or extremely hazardous substance is released, immediate notice must be given to the WDEQ Solid and Hazardous Waste Division and all other appropriate federal and state agencies.

Each mining company is expected to prepare and implement several plans and/or policies to ensure environmental protection from hazardous and extremely hazardous materials. These plans/policies include:

- Spill Prevention Control and Countermeasure Plans;

- Spill Response Plans;

- inventories of hazardous chemical categories pursuant to Section 312 of SARA, as amended; and

- Emergency Response Plans.

All mining operations are also required to be in compliance with regulations promulgated under the Resource Conservation and Recovery Act, Federal Water Pollution Control Act (Clean Water Act), Safe Drinking Water Act, Toxic Substances Control Act, Mine Safety and Health Act, and the Federal Clean Air Act. In addition, mining operations must comply with all attendant state rules and regulations relating to hazardous material reporting, transportation, management, and disposal.

Compliance with these rules is the current practice at Antelope Mine. Acquisition of the Horse Creek LBA Tract by ACC would not significantly change these current practices nor the amount or type of any wastes generated or disposed at the mine, although quantities of some wastes would increase in proportion to anticipated increases in coal production (e.g., fuel, lubricants, and shop and office wastes).

2.2 Alternative 1

Alternative 1 is the No-Action Alternative. Under the No-Action Alternative, ACC's coal lease application would be rejected, the Horse Creek LBA Tract would not be offered for competitive sale, and the coal contained within the tract would not be mined. Rejection of the application would not affect permitted mining activities on existing leases at the Antelope Mine. Approximately 6,009 acres are currently leased at Antelope Mine and about 5,172 acres will eventually be affected. Under the No-Action Alternative, average annual production will probably not exceed 22 mmtpy, and average employment will remain at 180 persons. Portions of the surface of the LBA tract would probably be disturbed due to overstripping to allow coal to be removed from existing, contiguous leases.

For purposes of this analysis, it is assumed that if the No-Action Alternative is selected the LBA tract would not be mined in the foreseeable future. Selection of this alternative would not preclude leasing of this tract in the future; however, this assumption allows a comparison of the economic and environmental consequences of mining these lands versus not mining them. If the No-Action Alternative is selected as the preferred alternative, the assumption that the Horse Creek LBA Tract would not be mined in the foreseeable future would become more likely if leasing is postponed beyond the time that this tract could be mined as an extension of an existing operation.

2.3 Alternative 2

BLM is considering alternate tract configurations for the Horse Creek LBA Tract in order to minimize the risk of bypassing federal coal that would potentially become economically unrecoverable or to enhance the fair market value of the Horse Creek LBA Tract and/or the remaining unleased federal coal in this area. As part of the preliminary geologic analysis of the federal coal resources in and around the Horse Creek LBA Tract, the BLM identified adjacent unleased federal coal that might be bypassed if it is not included in the tract. This adjacent unleased coal has a high stripping ratio, however, so adding it to the tract as applied for could reduce the average value of the coal resources in the tract. The lands that BLM is considering adding to the tract are:

T.41N., R.71W., 6th P.M., Campbell County, Wyoming

Section 11, Lot 13;	42.34 acres
Section 14, Lots 3 and 4;	82.64 acres
Section 22, Lots 2 and 16	85.20 acres
Section 27, Lots 6, 7, 10 and 11	166.92 acres
Total:	377.10 acres

The increase to the Horse Creek LBA Tract would be 377.10 acres containing about 35.2 million tons of coal. The reconfiguration results in a tract comprising 3,215.0 acres containing approximately 299.7 millions tons of mineable coal.

2.4 Alternatives Considered but Not Analyzed in Detail

2.4.1 Alternative 3

Under this alternative, as under the Proposed Action and Alternative 2, the BLM would hold a competitive, sealed-bid sale for the lands included in the Horse Creek LBA Tract. Alternative 3 assumes, however, that the successful qualified bidder would be someone other than the applicant and that this bidder would plan to open a new mine to develop the coal resources in the LBA tract.

This alternative is not analyzed in detail in this EIS because it is doubtful that the Horse Creek LBA Tract (as applied for or as modified) includes sufficient coal resources to economically support a new mine start. It is also unlikely that the tract could be reconfigured to attract bidders interested in opening a new mine because the adjacent unleased coal that could be added to the north and/or west is under deeper cover, making it unattractive to entities evaluating coal tracts for new mine starts as well as to ACC.

A new stand-alone mine would require considerable initial capital expenses, including the construction of new surface facilities (i.e., offices, shops, warehouses, coal processing facilities, coal loadout facilities, and rail spur), extensive baseline data collection, and development of a mining and reclamation plan. A company acquiring this coal would have to compete for customers with established mines in a competitive market that is currently characterized by low prices.

The environmental impacts of developing a new mine to recover the coal resources in the LBA tract would be greater than under the Proposed Action, the No Action Alternative, or Alternative 2 because of the need for new facilities, a new rail line, new employment, and the creation of additional sources of dust. In the event that a lease sale is held and the applicant is not the successful bidder, the successful bidder would be required to submit a detailed mining and reclamation plan for approval before the tract could be mined, and this NEPA analysis would be reviewed and supplemented as necessary prior to approval of that mining and reclamation plan.

2.4.2 Alternative 4

There are two major sources of revenue to state and federal governments from the leasing and mining of federal coal: 1) the competitive bonus bid paid at the time the coal is leased, and 2) a 12.5 percent royalty collected when the coal is sold. Under Alternative 4, BLM would delay the sale of the Horse Creek LBA Tract until PRB coal prices increase. This could potentially increase the fair market value of the coal resources in the LBA tract, which could increase the bonus bid when the coal is leased. However, the price paid for coal from northeastern Wyoming has decreased by more than $1.00 per ton since 1992, and an increase in coal prices is unlikely in the foreseeable future.

The Clean Air Act Amendments of 1990 include provisions that encourage the use of low sulfur coal. As power plants have switched to PRB coal to meet the new Clean Air Act requirements for lower plant emissions, production of low sulfur PRB coal has increased by more than ten percent annually since 1992, but coal prices have not increased with this increased demand.

The royalty payments are the larger of the two revenue sources. Royalty payments increase if coal prices increase because they are collected at the time the coal is sold. Postponement of the lease sale until PRB coal prices rise could conceivably result in a higher bonus bid when the tract is sold, but it may not result in higher royalty income to the state or federal governments. There is a delay between the time the coal is leased and when it can be mined and royalty payments collected, during which time higher coal price may or may not persist. If the coal is already leased when prices increase, higher royalty payments will be collected immediately, and the coal lessee may be able to negotiate longer term contracts at higher prices, which would result in more royalty income to the government. If leasing is delayed too long, the adjacent mining operation may be completed. If mining the coal in the LBA tract requires a new mine start, the fair market value of the coal may actually drop because of the high cost of starting a new mine.

Other considerations include the value of leaving the mineable coal for future development versus the value of making low-sulfur coal available now, in anticipation of cleaner fuel sources being developed in the future. Continued leasing of PRB coal enables coal-fired power plants to meet Clean Air Act requirements without constructing new plants, revamping existing plants, or switching to existing alternative fuels, which would probably significantly increase power costs for individuals and businesses. If cleaner fuel sources are developed in the future, they could be phased in with less economic impact to the public.

A range of the potential future economic benefits of delaying leasing until coal prices rise could be quantified in an economic analysis, but the benefits would have to be discounted to the present, which would make this alternative less attractive now. The environmental impacts of mining the coal at a later time as part of an existing mine would be expected to be similar and about equal to the Proposed Action or Alternative 2. If a new mine start is required to mine the coal, the environmental impacts would be expected to be greater than mining it as an extension of an existing mine.

2.5 Comparison of Alternatives

The locations of the Proposed Action and Alternative 2 for the Horse Creek LBA Tract are shown on Figure 2-1. A summary comparison of coal production, surface disturbance, mine life, and projected federal and state revenues for the Proposed Action and Alternatives 1 and 2 for

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the Horse Creek LBA Tract is presented in Table 2-1.

Table 2-2 presents a comparative summary of the direct and indirect environmental impacts of implementing each alternative as compared to the No-Action Alternative. The No-Action Alternative assumes completion of currently permitted mining at the Antelope Mine for comparison to the Horse Creek LBA Tract. Table 2-3 presents a comparative summary of cumulative environmental impacts of implementing each alternative. The environmental consequences of the Proposed Action and alternatives are analyzed in Chapter 4.0.

These summary impact tables are derived from the following explanation of impacts and magnitude. NEPA requires all agencies of the federal government to include, in every recommendation or report on proposals for legislation and other major federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on:

(i) the environmental impact of the proposed action,
(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
(iii) alternatives to the proposed action,
(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented (42 USC § 4332[C]).

Impacts can be beneficial or adverse, and they can be a primary result of an action (direct) or a secondary result (indirect). They can be permanent, long-term (persisting beyond the end of mine life and reclamation) or short-term (persisting during mining and reclamation and through the time the reclamation bond is released). Impacts also vary in terms of significance. The basis for conclusions regarding significance are the criteria set forth by the Council on Environmental Quality (40 CFR 1508.27) and the professional judgement of the specialists doing the analyses. Impact significance may range from negligible to substantial; impacts can be significant during mining but be reduced to insignificance following completion of reclamation.

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Table 2-1. Summary Comparison of Coal Production, Surface Disturbance, and Mine Life for Horse Creek LBA Tract and Antelope Mine

Item	**No Action Alternative (Existing Antelope Mine)**	**Added by Proposed Action**	**Added by Alternative 2**
Mineable Coal (as of January 1, 1999)	198 million tons	264.5 million tons	299.7 million tons
Recoverable Coal [1] (as of January 1, 1999)	183.7 million tons	246.0 million tons	278.7 million tons
Coal Mined Through 1998	98.8 million tons	--	--
Lease Acres	6,008.9 acres	2,837.9 acres	3,215.0 acres
Total Area To Be Disturbed'	5,172.0 acres	3,189.6 acres	3,580.9 acres
Permit Area	7,683.3 acres	3,189.2 acres	3,580.0 acres
Average Annual Post-1998 Coal Production	22 million tons	8 million tons	8 million tons
Remaining Life Of Mine (post-1998)	9 years	8 years	9 years
Average No. Of Employees	180	70	70
Total Projected State Revenues (post-1998)[2]	$ 202.1 million	$ 270.6 million	$ 306.6 million[4]
Total Projected Federal Revenues (post-1998)[3]	$ 45.9 million	$ 90.6 million	$ 102.6 million[4]

[1] Assumes 95 percent recovery of leased coal remaining after eliminating coal within 100 feet of the railroad and county road rights of way.

[2] Projected revenue to State of Wyoming is $1.10 per ton of coal sold and includes income from severance tax, property and production taxes, sales and use taxes, and Wyoming's share of federal royalty payments (University of Wyoming 1994).

[3] Federal revenues based on $4.00/ton price x federal royalty of 12.5 percent x amount of recoverable coal plus bonus payment on LBA coal of 22¢/ton based on average of last nine LBA's (see Table 1-1) x amount of leased coal less state's 50 percent share.

[4] The projected federal and state income shown under this alternative may be overstated. The inclusion of the higher-cover coal added under Alternative 2 would probably reduce the per ton bonus price relative to Alternative 1, which would decrease the anticipated state and federal revenues.

Table 2-2. Summary Comparison of Magnitude[1] and Duration of Direct and Indirect Impacts for the Proposed Action, Alternative 2, and the No-Action Alternative for the Horse Creek LBA Tract[2]

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	**MAGNITUDE AND DURATION OF IMPACT**	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION & ALTERNATIVE 2**
TOPOGRAPHY & PHYSIOGRAPHY		
PERMANENT TOPOGRAPHIC MODERATION could result in:		
Microhabitat reduction	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Habitat diversity reduction	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Reduction in water runoff and peak flows	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Increased precipitation infiltration	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Wildlife carrying capacity reduction	Moderate, possibly short term on existing mine area	Same as No Action on expanded mine area
Reduction in erosion	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Enhanced vegetative productivity	Moderate, beneficial, long term on existing mine area	Same as No Action on expanded mine area
Potential acceleration of groundwater recharge	Moderate, long term on existing mine area	Same as No Action on expanded mine area
GEOLOGY AND MINERALS		
SUBSURFACE changes would result in:		
Removal of coal	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Removal and replacement of topsoil and overburden	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Physical characteristic alterations in geology	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Loss of coal bed methane	Moderate, permanent on existing mine area	Same as No Action on expanded mine area
SOILS		
CHANGES IN PHYSICAL PROPERTIES would include:		
Increased near-surface bulk density	Moderate, long term on existing mine area	Same as No Action on expanded mine area
More uniformity in soil type, thickness, and texture	Moderate, beneficial, long term on existing mine area	Same as No Action on expanded mine area
Increased uniformity in mixed soils (e.g., texture)	Moderate, beneficial, long term on existing mine area	Same as No Action on expanded mine area
Decreased soil loss due to topographic modification	Moderate, beneficial, long term on existing mine area	Same as No Action on expanded mine area
CHANGES IN CHEMICAL PROPERTIES would include:		
Uniform soil nutrient distribution	Moderate, beneficial, long term on existing mine area	Same as No Action on expanded mine area
CHANGES IN BIOLOGICAL PROPERTIES would include:		
Organic matter reduction	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Microorganism population reduction	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Existing plant habitat reduction in soils stockpiled before placement	Moderate, long term on existing mine area	Same as No Action on expanded mine area

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[1] Refer to Section 4.0 and 4.1 for a discussion on magnitude of impacts.

[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-2 Continued

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	MAGNITUDE AND DURATION OF IMPACT	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION & ALTERNATIVE 2**
AIR QUALITY		
IMPACTS ASSOCIATED WITH MINING OPERATIONS would include:		
Elevated concentration levels of TSP	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Elevated concentrations of gaseous emissions	Negligible, short term on existing mine area	Moderate short term on expanded mine area
WATER RESOURCES		
SURFACE WATER		
CHANGES IN RUNOFF CHARACTERISTICS AND SEDIMENT DISCHARGE include the following:		
Disruption of surface drainage systems	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Increased runoff and erosion rates	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Increased infiltration	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Reduction in peak flows	Moderate, long term on existing mine area	Same as No Action on expanded mine area
GROUNDWATER		
GROUNDWATER RESOURCE IMPACT would include the following:		
Removal of coal and overburden aquifers	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Replacement of existing coal and overburden with spoil aquifers	Negligible, long term on existing mine area	Same as No Action on expanded mine area
Depressed water levels in aquifers adjacent to mines	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Change in hydraulic properties	Negligible, long term on existing mine area	Same as No Action on expanded mine area
Change in groundwater quality in backfilled areas	Moderate, long term on existing mine area	Same as No Action on expanded mine area
ALLUVIAL VALLEY FLOORS		
While a final determination has not been made by WDEQ/LQD, it is believed that there are no AVF's significant to agriculture on the proposed lease tract	No impact on existing mine area	Same as No Action on expanded mine area
WETLANDS		
Removal of all existing wetlands	Wetlands on existing mine areas would be mined and reclaimed	Same as No Action on expanded mine area
VEGETATION		
PROGRESSIVE REDUCTION IN NATIVE VEGETATION would result in:		
Increased erosion	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Wildlife and livestock habitat loss	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Wildlife habitat carrying capacity loss	Moderate, long term on existing mine area	Same as No Action on expanded mine area

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[1] Refer to Section 4.0 and 4.1 for a discussion on magnitude of impacts.

[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-2 Continued

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	MAGNITUDE AND DURATION OF IMPACT	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION & ALTERNATIVE 2**
VEGETATION (Continued)		
AFTER RECLAMATION the following could result:		
Changes in surface water networks	Negligible, long term on existing mine area	Same as No Action on expanded mine area
Reduction in vegetation diversity	Negligible, long term on existing mine area	Same as No Action on expanded mine area
Reduction in shrub density	Negligible, long term on existing mine area	Same as No Action on expanded mine area
WILDLIFE		
DURING MINING the following could occur:		
Wildlife displacement	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Pronghorn passage reduction	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Increased mortality rate to small mammals	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Temporary displacement of small mammals	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Sage grouse habitat removal	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Abandonment of raptor nests	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Foraging habitat reduction for raptors	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Loss of nesting and foraging habitat for MBHFI	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Reduction in waterfowl resting and feeding habitat	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Loss of songbird foraging habitat	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Temporary wildlife habitat loss	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Continued road kills by mine-related traffic	Negligible, short term on existing mine area	Same as No Action on expanded mine area
THREATENED, ENDANGERED AND CANDIDATE SPECIES		
MINING IMPACTS could result in the following:		
Loss of black-footed ferret colonies	No impacts on existing mine area	Same as No Action on expanded mine area
Loss of bald eagle nesting and foraging habitat	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Loss of peregrine falcon nesting and foraging habitat	No impact on existing mine area	Same as No Action on expanded mine area
Loss of Ute Ladies-tresses orchid habitat	Negligible on existing mine area	Same as No Action on expanded mine area
Loss of mountain plover habitat	Negligible on existing mine area	Same as No Action on expanded mine area
Loss of swift fox habitat	Negligible on existing mine area	Same as No Action on expanded mine area
LAND USE AND RECREATION		
ENVIRONMENTAL CONSEQUENCES ON LAND USE would be:		
Reduction of livestock grazing	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Loss of wildlife habitat	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Curtailment of oil and gas development	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Loss of public land available for recreation activities	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Loss of coal bed methane reserves	Moderate, permanent on existing mine area	Same as No Action on expanded mine area

[1] Refer to Section 4.0 and 4.1 for a discussion on magnitude of impacts.

[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-2 Continued

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE AND DURATION OF IMPACT***	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION & ALTERNATIVE 2**
CULTURAL RESOURCES		
12 sites not eligible or recommended not eligible for NRHP 3 eligible for NRHP/3 pending mitigation	Impacts to eligible or unevaluated sites are not permitted; any site eligible for the NRHP would be avoided or mitigated through data recovery	Same as No Action on expanded mine area Same as No Action on expanded mine area
Possible increase in vandalism	No impacts on existing mine area	Negligible on expanded mine area
Possible increase in unauthorized collecting	No impacts on existing mine area	Negligible on expanded mine area
NATIVE AMERICAN CONCERNS	No impact identified on existing mine area	Same as No Action on expanded mine area
PALEONTOLOGICAL RESOURCES		
Overburden removal could expose fossils for scientific examination	No impact identified on existing mine area	Same as No Action on expanded mine area
VISUAL RESOURCES		
EVIDENT IMPACTS DURING MINING include the following:		
Alteration of landscape classified by the USFS as "common"	Negligible, short term on existing mine area	Same as No Action on expanded mine area
IMPACTS FOLLOWING RECLAMATION could be:		
Smoother sloped terrain	Negligible, long term on existing mine area	Same as No Action on expanded mine area
Reduction in sagebrush density	Negligible, short term on existing mine area	Same as No Action on expanded mine area
NOISE		
INCREASED NOISE LEVELS could effect:		
Nearby occupied dwellings	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Wildlife in immediate vicinity	Negligible, short term on existing mine area	Same as No Action on expanded mine area
TRANSPORTATION FACILITIES		
Increase in duration that coal is shipped on railroads and employees travel on highways by 8-9 years	No impact on existing mine area	Negligible, short term on expanded mine area
Relocation of pipelines	No impact on existing mine area	Negligible, short term on expanded mine area
Relocation of utility lines	No impact on existing mine area	Same as No Action on expanded mine area

[1] Refer to Section 4.0 and 4.1 for a discussion on magnitude of impacts.

[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-2 Continued

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	MAGNITUDE AND DURATION OF IMPACT	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION & ALTERNATIVE 2**
SOCIOECONOMICS		
EFFECTS DURING MINING would include:		
Employment Potential (increase of up to 70 jobs in expanded mine area is expected)	Moderate, beneficial short term on existing mine area	Increased moderate, beneficial, short term on expanded mine area
Revenues from royalties and taxes to the state government	Moderate, beneficial short term on existing mine area	Increased moderate, beneficial, short term on expanded mine area
Revenues from royalties and taxes to the federal government	Moderate, beneficial short term on existing mine area	Increased moderate, beneficial, short term on expanded mine area
Economic development	Moderate, beneficial short term on existing mine area	Increased moderate, beneficial, short term on expanded mine area
Population in Campbell and Converse counties	No impact on existing mine area	Negligible, short term on expanded mine area

[1] Refer to Section 4.0 and 4.1 for a discussion on magnitude of impacts.

[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-3. Summary Comparison of Magnitude and Duration of Cumulative Impacts[1, 2]

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE TYPE AND DURATION OF IMPACT***	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION & ALTERNATIVE 2**
TOPOGRAPHY & PHYSIOGRAPHY REDUCED RELIEF AND SUBDUED TOPOGRAPHY could result in:		
Reduction in topographic diversity	Negligible, long term on existing mine areas	Same as No Action on expanded mine areas
Increased precipitation infiltration	Negligible, long term on existing mine areas	Same as No Action on expanded mine areas
Biodiversity reduction	Negligible, long term on existing mine areas	Same as No Action on expanded mine areas
Big game carrying capacity reduction	Negligible, long term on existing mine areas	Same as No Action on expanded mine areas
GEOLOGY AND MINERALS RECOVERY OF COAL would result in:		
Stabilization of municipal, county and state economies	Significant, beneficial, short term on existing mine areas	Same as No Action on expanded mine areas
SOILS RECLAIMED SOILS could result in:		
Increased soil productivity	Negligible, long term on existing mine areas	Same as No Action on expanded mine areas
Reduced erosion	Negligible, long term on existing mine areas	Same as No Action on expanded mine areas
AIR QUALITY IMPACTS ASSOCIATED WITH MINING OPERATIONS would include:		
Elevated concentration levels of TSP	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
Elevated concentrations of gaseous emissions	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
WATER RESOURCES SURFACE WATER IMPACTS TO SURFACE WATER could result in:		
Temporary reduction in soil infiltration rates and increased runoff	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
GROUNDWATER IMPACTS ON GROUNDWATER could result in:		
Replacing coal and overburden aquifers with spoil aquifers	Negligible, long term on existing mine areas	Same as No Action on expanded mine areas
Drawdown in the coal and shallower aquifers in surrounding areas	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
Water-level decline in the sub-coal Fort Union Formation	Negligible to moderate, short term on existing mine areas	Same as No Action on expanded mine areas
Change in groundwater quality as a result of mining	Negligible, long term on existing mine areas	Same as No Action on expanded mine areas
ALLUVIAL VALLEY FLOORS	No cumulative impacts anticipated on existing mine areas	Same as No Action on expanded mine areas
WETLANDS		
Removal of existing wetlands	Wetlands on existing mine areas would be mined and reclaimed	Same as No Action on expanded mine areas

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[1] Refer to Section 4.5 for a discussion of cumulative impacts.

[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-3 Continued

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE TYPE AND DURATION OF IMPACT***	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION & ALTERNATIVE 2**
VEGETATION		
SURFACE DISTURBANCE would result in:		
Loss of common native vegetation types for wildlife	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
Regional loss of vegetative diversity	Negligible, long term on existing mine areas	Same as No Action on expanded mine areas
WILDLIFE		
IMPACTS ON WILDLIFE FROM SURFACE MINING could result in:		
Loss of pronghorn habitat	Moderate, short term on existing mine areas	Same as No Action on expanded mine areas
Mule deer and white tail deer population reduction	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
Reduction in raptor nesting sites and foraging habitat	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
Reduction in sage grouse leks	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
Loss of nesting and foraging habitat for MBHFI	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
Reduction in waterfowl habitat	Minor, short term on existing mine areas	Same as No Action on expanded mine areas
Permanent reduction in wildlife habitat diversity	Major, long term on existing mine areas	Same as No Action on expanded mine areas
Permanent reduction in some wildlife carrying capacity	Major, long term on existing mine areas	Same as No Action on expanded mine areas
THREATENED, ENDANGERED AND CANDIDATE SPECIES		
No significant cumulative impacts to T & E species are projected	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
LAND USE AND RECREATION		
IMPACTS ON LAND USE could result in:		
Loss of agricultural production	Moderate, short term on existing mine areas	Same as No Action on expanded mine areas
Disruption of oil and gas development/production	Moderate to significant, short term on existing mine areas	Same as No Action on expanded mine areas
Reduction of wildlife habitat	Moderate, short term on existing mine areas	Same as No Action on expanded mine areas
IMPACTS ON RECREATION could result in:		
Loss of access to public lands used by recreationists, particularly hunting	Moderate, short term on existing mine areas	Same as No Action on expanded mine areas
CULTURAL RESOURCES	Sites eligible for NRHP would be mitigated on existing mine areas	Same as No Action on expanded mine areas
NATIVE AMERICAN CONCERNS	No impact identified on existing mine areas	Same as No Action on expanded mine areas

[1] Refer to Section 4.5 for a discussion of cumulative impacts.
[2] All impacts are assumed to be adverse unless noted otherwise.

3.0 AFFECTED ENVIRONMENT

This chapter describes the existing conditions of the physical, biological, cultural, and socioeconomic resources in the study area. The resources that are addressed here were identified during the scoping process or interdisciplinary team review as having the potential to be affected. Figure 3-1 shows the general analysis area for most environmental resources.

Critical elements of the human environment (BLM[1] 1988) that could potentially be affected by the proposed actions include air quality, cultural resources, Native American religious concerns, T&E species, hazardous or solid wastes, water quality, wetlands/riparian zones invasive non-native species and environmental justice. Five other critical elements (areas of critical environmental concern, prime or unique farmlands, floodplains, wild and scenic rivers, and wilderness) are not present in the project area and are not addressed further. In addition to the critical elements that are potentially present in the project area, this EIS discusses the status and potential effects of mining the LBA tract on topography and physiography, geology and mineral resources, soils, water quantity, alluvial valley floors, wetlands, vegetation, wildlife, land use and recreation, paleontological resources, visual resources, noise, transportation resources, and socioeconomics.

3.1 General Setting

The project area is located in the PRB, a part of the Northern Great Plains which includes most of northeastern Wyoming. Vegetation is primarily sagebrush and mixed grass prairie. The climate is semi-arid, with an average annual precipitation at Wright (see Figure 3-1) of just over 11 inches (Martner 1986). June (2.35 inches) and May (2.04 inches) are the wettest months, and February (0.29 inch) is the driest. Snowfall averages 25.1 inches per year, with most occurring in March (5.0 inches) and December (4.5 inches). Potential evapotranspiration, at approximately 31 inches (National Oceanic and Atmospheric Administration 1969), exceeds annual precipitation. The average daily mean temperature is 44.2°F. The highest recorded temperature was 103°F and the lowest was -34°F. July is the warmest month, with a mean daily temperature of 70°F, and January is the coldest (20.5°F). The frost-free period is 100-125 days.

The 1997 average annual wind speed at the Antelope Mine (see Figure 3-1) was 11.5 mph, with winter gusts often reaching 30-40 mph. Wind speeds are highest in the winter and spring and are predominantly from the southwest and west. During periods of strong wind, dust may impact air quality across the region.

There are an average of 15 air-stagnation events annually in the

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[1] Refer to page vii for a list of abbreviations and acronyms used in this document.

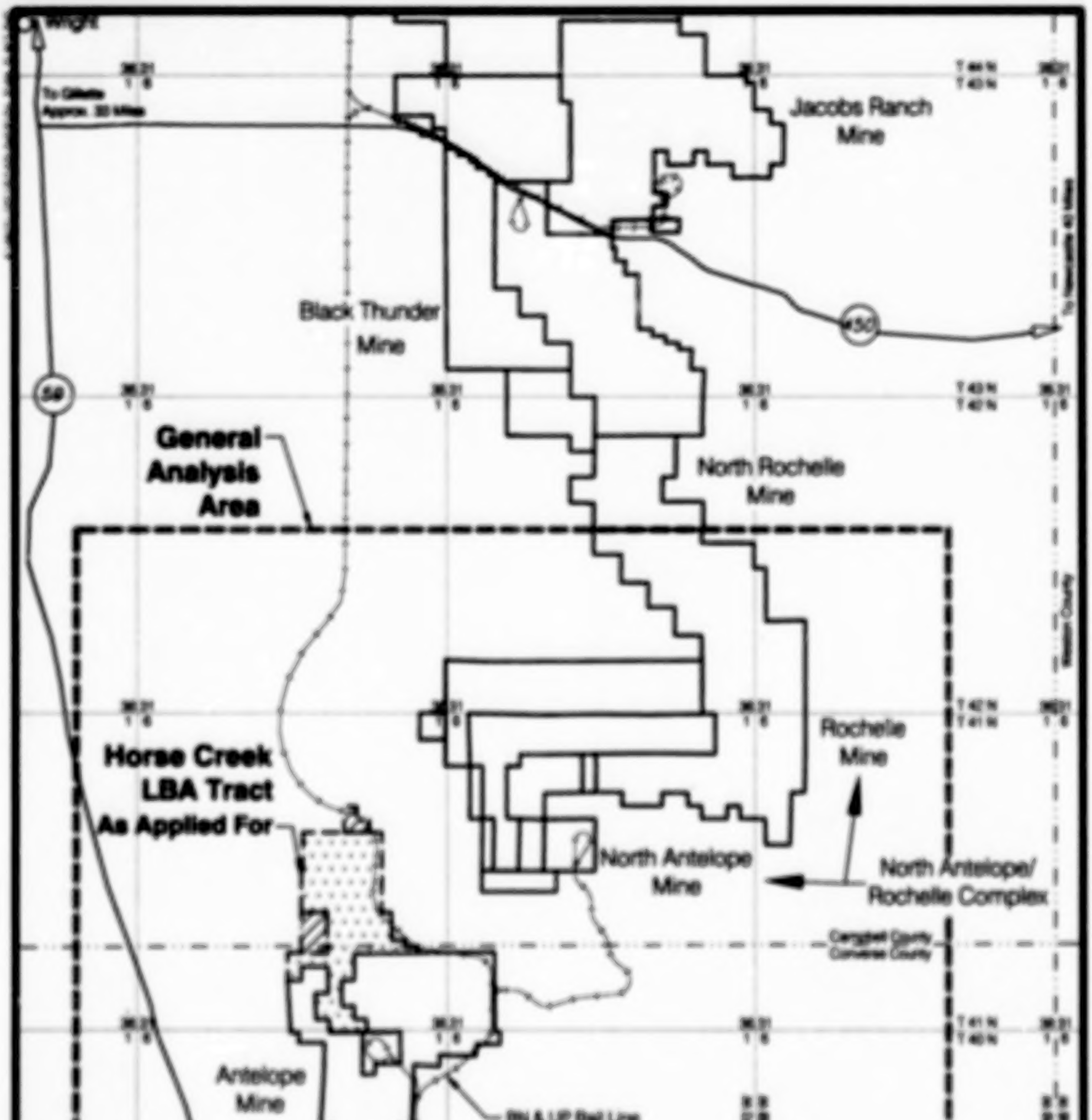

Figure 3-1. Location Map Showing Southern PRB Mines and General Analysis Area.

PRB with an average duration of two days each (BLM 1974). General information describing the area's resources were gathered from draft BLM Buffalo Resource Area planning documents (BLM 1996a, 1996b, 1996c, 1996d, 1996g) and a BLM coal leasing study (BLM 1996e).

3.2 Topography and Physiography

The PRB is an elongated, asymmetrical structural downfold. It is bounded by the Casper Arch, Laramie Mountains, and Hartville Uplift to the south; the Miles City Arch in Montana to the north, the Big Horn Mountains on the west, and the Black Hills on the east. The Antelope Mine is located on the gently dipping eastern limb of the structural basin, near the southern end. The regional dip in the area of the mine is approximately 1 degree to the northwest. There are local areas where the shallow strata dip at higher angles, generally due to local folding or faulting.

The PRB landscape consists of broad plains, low hills, and tablelands. Generally, the topography changes from open hills with 500-1,000 ft of relief in the northern part of the PRB to plains and tablelands with 300-500 ft of relief in the southern part. Playas are common in the basin, as are buttes and plateaus capped by clinker or sandstone. The LBA tract is in an area consisting primarily of dissected uplands with an elevation ranging from 4,500 to 4,800 ft. Overall, the Horse Creek LBA Tract is similar to the rest of the current permit area, where slopes range from flat to 34% and average about 5%. Slope analyses would be done for the Horse Creek LBA Tract if it is leased.

3.3 Geology

Stratigraphic units in the mine area that would be impacted if the Horse Creek LBA Tract is leased include, in descending order, recent (Quaternary age) alluvial and eolian deposits, the Eocene age Wasatch Formation (the overburden), and the Paleocene age Fort Union Formation (which contains the target coal beds). Figure 3-2 shows two geologic cross-sections drawn through the Horse Creek LBA Tract (one north-south and one east-west). These cross sections are representative of the geology in the vicinity of the LBA tract, with the primary variables being the amount of sandstone in the overburden, the local presence of overlying (rider) coal seams that are not mineable, the parting thickness between the two mineable coal seams, and the surface topography. Figure 3-3 is a chart showing the stratigraphic relationships and hydrologic characteristics of the surface and subsurface geologic units in the area of the Antelope Mine.

Surficial deposits in the analysis area include Quaternary alluvial and eolian deposits, clinker, and weathered Wasatch and Fort Union Formations. There is no clinker on the LBA tract itself, although it is present in the analysis area. There are alluvial deposits along Antelope and Horse Creeks. They typically consist primarily of poor to well-sorted, irregularly bedded to

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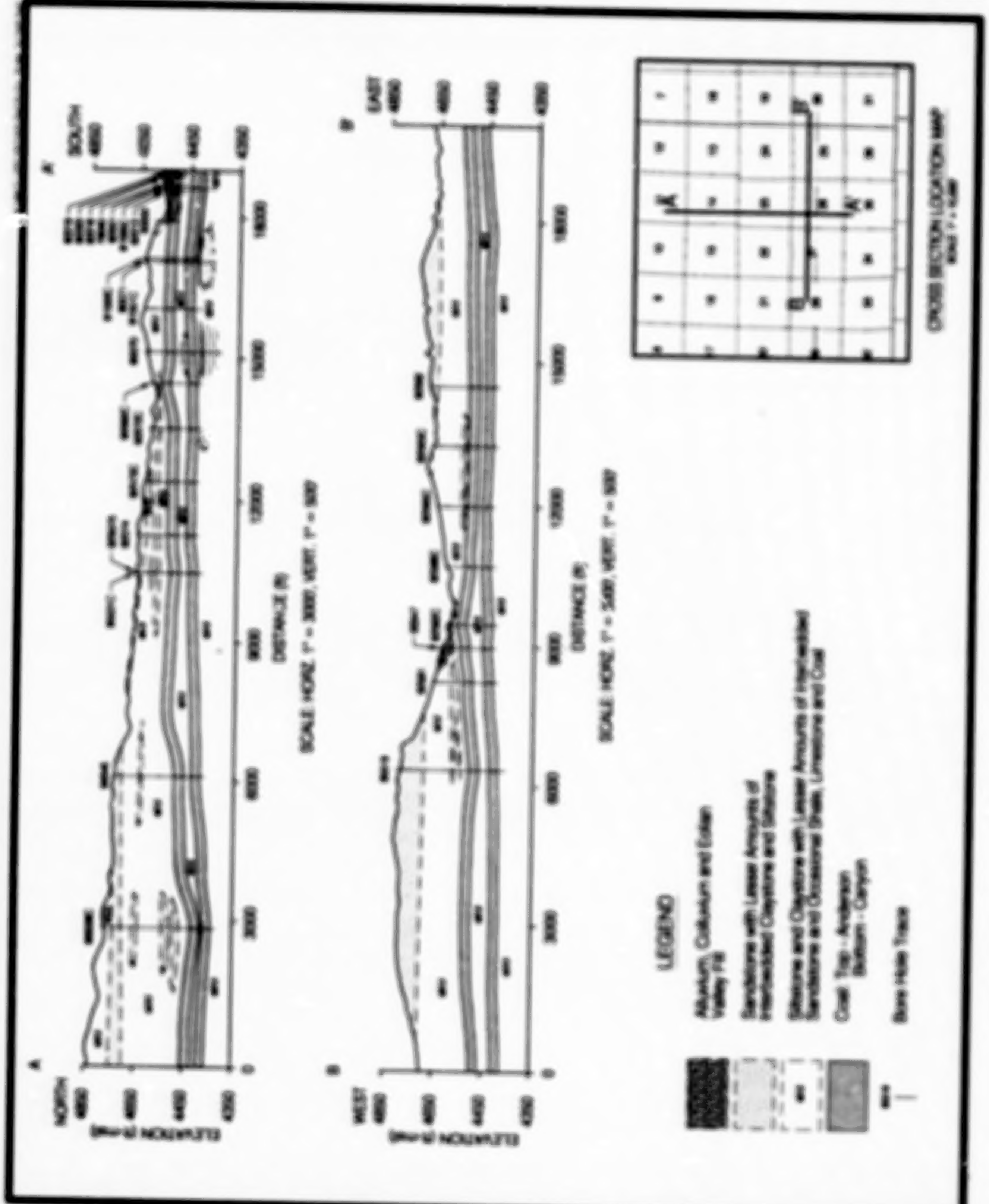
A
A'
NORTH
SOUTH
4850
4650
4450
4250
ELEVATION (ft-msl)
0
3000
6000
9000
12000
15000
18000
DISTANCE (ft)
SCALE: HORZ. 1" = 3000', VERT. 1" = 500'
B
B'
WEST
EAST
DISTANCE (ft)
SCALE: HORZ. 1" = 3400', VERT. 1" = 500'
LEGEND
Alluvium, Colluvium and Eolian Valley Fill
Sandstone with Lesser Amounts of Interbedded Claystone and Siltstone
Siltstone and Claystone with Lesser Amounts of Interbedded Sandstone and Occasional Shale, Limestone and Coal
Coal: Top - Anderson
Bottom - Canyon
Bore Hole Trace
CROSS SECTION LOCATION MAP

Figure 3-2. North-South and East-West Geologic Cross Sections, Horse Creek LBA Tract.

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Geologic Unit			Hydrologic Characteristics
RECENT ALLUVIUM HOLOCENE			Typically fine grained and poorly sorted in intermittent drainages. Occasional very thin, clean interbedded sand lenses. Low yields and excessive dissolved solids generally make these aquifers unsuitable for domestic, agricultural and livestock usage. Low infiltration capacity unless covered by sandy eolian blanket.
CLINKER HOLOCENE TO PLEISTOCENE			Baked and fused bedrock resulting from burning coal seams which ignite on the outcrop from lightning, manmade fires or spontaneous combustion. The reddish clinker (locally called scoria, red dog, etc.) formed by melting and partial fusing from the burning coal. The baked rock varies greatly in the degree of alteration, some is dense and glassy while some is vesicular and porous. It is commonly used as a road construction material and is an aquifer wherever saturated.
WASATCH FORMATION EOCENE			Lenticular fine sands interbedded in predominantly very fine grained siltstone and claystone may yield low to moderate quantities of poor to good quality water. The discontinuous nature and irregular geometry of these sand lenses result in low overall permeabilities and very slow groundwater movement in the overburden on a regional scale. Water quality in the Wasatch formation generally does not meet Wyoming Class I drinking water standards due to the dissolved mineral content. Some wells do, however, produce water of considerably better quality which does meet the Class I standard.
FORT UNION FORMATION PALEOCENE	TONGUE RIVER MEMBER		The coal serves as a regional groundwater aquifer and exhibits highly variable aquifer properties. Permeability and porosity associated with the coal arise almost entirely from fractures. Coal water typically does not meet Class I or Class II (irrigation) use standards. In most cases, water from coal wells is suitable for livestock use. The coal water is used throughout the region as a source of stock water and occasionally for domestic use.
	LEBO MEMBER		The Lebo Member, also referred to as "The Lebo Confining Layer" has a mean thickness of 711 feet in the PRB and a thickness of about 400 feet in the vicinity of Gillette (Lewis and Hotchkiss 1981). The Lebo typically yields small quantities of poor quality groundwater. Where sand content is locally large, caused by channel or deltaic deposits, the Lebo may yield as much as 10 gpm (Lewis and Hotchkiss 1981).
	TULLOCK MEMBER		The Tullock Member has a mean thickness of 785 feet in the PRB and a mean sand content of 53 percent which indicates that the unit generally functions well as a regional aquifer. Yields of 15 gpm are common but very locally and may be as much as 40 gpm. Records from the SEO indicate that maximum yields of approximately 300 gpm have been achieved from this aquifer. Water quality in the Tullock Member often meets Class I standards. The extensive sandstone units in the Tullock Member are commonly developed regionally for domestic and industrial uses. The City of Gillette is currently using eight wells completed in this zone to meet part of its municipal water requirements.
UPPER CRETACEOUS	LANCE FORMATION		Sandstone and interbedded sandy shales and claystone provide yields generally of less than 20 gpm. Higher yields are sometimes achieved where sand thicknesses are greatest. Water quality is typically fair to good.
	FOX HILLS SANDSTONE		Sandstone and sandy shales yield up to 200 gpm, however, yields are frequently significantly less. The water quality of the Fox Hills is generally good with TDS concentrations commonly less than 1000 mg/l.
	PIERRE SHALE		This unit is comprised predominantly of marine shales with only occasional local thin sandstone lenses. Maximum yields are minor and overall the unit is not water bearing. Water obtained from this unit is poor with high concentrations of sodium and sulfate as the predominant ions in solution.
W = WYODAK COAL; A = ANDERSON COAL; C = CANYON COAL			

Figure 3-3. Stratigraphic Relationships and Hydrologic Characteristics of Latest Cretaceous and Early Tertiary and Recent Periods, Powder River Basin, Wyoming. (Compiled from Hodson et al. 1973 and Lewis and Hotchkiss 1981).

laminated, unconsolidated sand, silt, and clay with minor intervals of fine gravel. These deposits have been the subject of AVF investigations and determinations (refer to Section 3.7).

The Wasatch Formation forms most of the overburden on top of the recoverable coal seams in the Fort Union Formation in the general analysis area. It consists of interbedded lenticular sandstones, siltstones, shales, and thin discontinuous coals. There is no distinct boundary between the Wasatch Formation and the underlying Fort Union Formation. According to mapping by Denson and others (1978), the Wasatch-Fort Union contact occurs several feet above the upper mineable coal zone in the area of the Horse Creek LBA Tract. From a practical standpoint, however, mine personnel generally consider the top of the mineable coal zone as the contact between the two formations. The average overburden thickness on the LBA tract is 150 feet. Overburden thickness generally increases to the west and north due to dip of the beds in this area. Overburden thickness decreases in stream valleys, like Horse Creek, where it has been removed by erosion.

The Fort Union Formation consists primarily of shales, mudstones, siltstones, lenticular sandstones, and coal. It is divided into three members, the Tongue River (which contains the target coal seams), Lebo and Tullock (in descending order, see Figure 3-3).

The Tongue River member consists of sandstone, siltstone, mudstone, coal, carbonaceous shales, and occasional thin conglomerate and limestone beds. At the Antelope Mine, there are two mineable coal seams, the Anderson and the Canyon, at the top of the Tongue River member. A few miles north of the LBA tract, these two seams coalesce to form one thick coal seam which is generally referred to as the Wyodak coal seam. Several other names are applied to this coal seam, including the Wyodak-Anderson and Anderson-Canyon. The Wyodak coal seam is mined at the North Antelope/Rochelle complex, which is located several miles northeast of the LBA tract (Figure 3-1). On the Horse Creek LBA Tract, the Anderson seam averages 40 ft in thickness, and the average thickness of the Canyon seam is 35 feet. The interval between the coal seams is variable, but averages 45 feet in thickness on the LBA tract. Below the Canyon coal seam, interbedded shales, siltstones, sandstones and thin coal beds comprise the rest of the Tongue River member.

The Lebo Shale and Tullock members of the Fort Union Formation underlie the Tongue River member. They consist primarily of sandstone, siltstone, mudstone, shale and coal. In general, the Tullock member contains more sand than the Lebo Shale member.

Drilling and sampling programs are conducted by all mine operators to identify overburden material that may be unsuitable for reclamation (i.e., material that is not suitable for use in re-establishing vegetation or that may affect groundwater quality due to high concentrations of selenium or other constituents or adverse pH levels). As part of the mine permitting process, each mine operator develops a management plan to ensure that this unsuitable material is not placed in areas where it may affect groundwater quality or revegetation success. Each mine operator also develops backfill monitoring plans as part of the mine permitting process to evaluate the quality of the replaced overburden. These plans are in place for the existing Antelope Mine and would be developed for the Horse Creek LBA Tract if it is leased.

Mineral Resources

The PRB contains large reserves of fossil fuels including oil, natural gas or methane (from conventional reservoirs and from coal beds), and coal, all of which are currently being produced. In addition, uranium, bentonite, and scoria are mined in the PRB (BLM 1996g).

Coal. There are 15 active coal mines lying along a north/south line that parallels Highway 59 starting north of Gillette, Wyoming, and extending south for about 75 miles. (Due to ownership and other changes, the Caballo Rojo and Cordero Mines have combined to become the Cordero-Rojo Complex and the North Antelope and Rochelle Mines have combined to become the North Antelope/Rochelle Complex, see Figure 1-1.) The mines are located where the coal is at its shallowest depths, i.e., nearest the outcrop. A 16th active mine (Dave Johnston) is located near Glenrock, Wyoming, about 25 miles southwest of the Antelope Mine.

The Fort Union coal seams are subbituminous and are generally low-sulfur, low-ash coals. Typically, the coal being mined has a higher heating value in the southern PRB than in the area north of Gillette. According to analyses of 22 samples conducted by ACC, in the area of the Antelope Mine the Anderson coal seam has an average heating value of approximately 8,915 Btu/lb and contains an average of 4.3% ash, 0.26% sulfur, 32.7% volatile matter, 36.4% fixed carbon, and 26.6% moisture. Based on ACC's analysis of 32 samples from the Canyon coal seam in the area of the Antelope Mine, it has an average heating value of 8,842 Btu/lb and contains an average of 4.4% ash, 0.19% sulfur, 30.8% volatile matter, 37.7% fixed carbon, and 27.1% moisture.

Oil and Gas. Oil and gas have been produced in the PRB for more than 100 years from reservoir beds that range in age from Pennsylvanian to Oligocene (DeBruin 1996). There are approximately 500 fields that produce oil and/or natural gas from a number of formations of varying geologic ages in the PRB. The estimated mean amounts of undiscovered hydrocarbons in the basin are 1.94 billion barrels of recoverable oil and 1.60 trillion ft^3 of gas (USGS 1995). Depth to oil-bearing strata is generally between 4,000 ft and 13,500 ft, but some of the older wells are as shallow as 400 ft.

No producing or abandoned oil or gas wells are present on the LBA tract. The nearest producing well, the Hedgehog State 1-16 operated by Flying J Oil and Gas, Inc., is located about ½ mile west of the LBA tract in the NE1/4 NE1/4 of Section 16, T.41N., R.71W. The well produces gas and oil from the late Cretaceous Turner Sandstone at a depth of 9,677 ft.

Coal Bed Methane. The generation of methane gas from coal beds occurs as a natural process. Methane produced by coal may be trapped in the coal by overburden pressure, by the pressure of water in the coal, or by impermeable layers immediately above the coal. The methane may also migrate upward and be trapped in shallower rocks (like sandstone), or it may disperse to the atmosphere. Deeper coal beds have higher pressures and generally trap more gas. Under favorable geologic conditions, methane can be trapped at shallow depths in and above coal beds, and this seems to be the case in the PRB. The geologic conditions that can enhance methane entrapment at shallow depths include low matrix porosity and permeability in the coals, association of the gas with structurally high features in structurally deformed areas, and the existence of effective seals (Law and others 1991). Without the existence of one or more of these conditions which act to trap the gas in shallow coals or in adjacent sandstones, the gas escapes to the atmosphere. It is likely that much of the methane generated by the coal beds in the PRB has gradually escaped into the atmosphere because of the relatively shallow coal burial depths in the basin. However, a large amount also remains in the coal, probably due primarily to the presence of effective seals in the sediments overlying the coal.

Historically, methane has been reported flowing from shallow water wells and coal exploration wells in parts of the PRB. According to DeBruin and Jones (1989), most of the documented historical occurrences have been in the northern PRB. Olive (1957) references a water well in T.54N., R.74W. which began producing gas for domestic use in 1916.

Coal bed methane has been commercially produced since 1989 at Rawhide Butte Field, west of the Amax Eagle Butte Mine. Since that time, the production area has been expanded. Approximately 500 coal bed methane wells are currently producing, and as many as 890 could be producing in early 1999.

There is no coal bed methane production in the vicinity of the Horse Creek LBA Tract at this time. Coal bed methane projects are, however, in testing or commercial stages between Gillette and Wright (BLM 1992a; BLM 1995), and production is now reported as far south as T.45N., R.71W. The BLM completed an EIS evaluating coal bed methane on federal oil and gas leases south of Gillette in October 1997 (BLM 1997). The impacts of coal bed methane development in an area extending from the Montana state line to south of Wright and covering approximately 1.5 million acres, is currently being evaluated in the Wyodak Coal Bed Methane Project EIS (See Figure 1-1). That EIS analyzes the impacts of an additional 3,000 to 5,000 coal bed methane wells. The draft EIS was released to the public in May, 1999 (BLM 1999), and the final EIS was released on October 1, 1999 (BLM 1999b). There are currently no proposals or applications to develop coal bed methane on the Horse Creek LBA Tract. If exploration would indicate that coal bed methane resources can be economically developed in and near the LBA tract, then expansion of the production area is likely to continue. In the PRB, methane is typically recovered by the drilling and completion of wells similar to conventional oil and natural gas wells.

Bentonite. Layers of bentonite (decomposed volcanic ash) of varying thickness are present throughout the PRB. Some of the thicker layers are mined where they are near the surface, mostly around the edges of the basin. Bentonite has a large capacity to absorb water, and because of this characteristic it is used in a number of processes and products, including cat litter and drilling mud. No mineable bentonite reserves have been identified on the Horse Creek LBA Tract.

Uranium. Uranium exploration and mining were very active in the 1950's, when numerous claims were filed in the PRB. A decreased demand combined with increased foreign supply reduced uranium mining activities in the early 1980's; however, substantial uranium reserves exist in southwestern Campbell and northwestern Converse Counties. There are currently three in-situ leach operations in the PRB. No known uranium reserves exist on the Horse Creek LBA Tract.

Scoria. Scoria or clinker has been and continues to be a major source of gravel for road construction in the area. Scoria is present along the exposed outcrop of the Wyodak coal seam located along the east side of the mine, although scoria is not present on the LBA tract.

3.4 Soils

The soils on the LBA tract are typical of the soils that occur on the adjoining Antelope Mine. Most of the LBA tract was subjected to an Order 1 soil survey in 1978-79 as part of the ACC baseline study (Commonwealth Associates, Inc. 1980). In 1997-98 those portions of the Horse Creek LBA Tract and adjacent areas not covered in the 1978-79 study were subjected to an Order 1 survey. The area covered in both of the studies includes the LBA tract and the area that would be disturbed if the tract was mined.

Based on the baseline soils studies, there is enough suitable topsoil for salvaging within the LBA tract to redistribute suitable soils to a depth of 2.2 ft across the entire LBA tract.

All soil surveys were completed in accordance with WDEQ/LQD Guideline No. 1 which outlines required soils information necessary for a coal mining operation. The inventories included field sampling and observations at the requisite number of individual sites, and laboratory analysis of representative collected samples.

The following is a list of the soil series that comprise the various map units delineated on the proposed affected area associated with the Horse Creek LBA Tract. The soils considered hydric are so noted.

Soils developing predominantly in unconsolidated, stream-laid deposits (alluvium) on terraces and/or floodplains

- Bankard loamy sand, 0-3 percent slopes
- Glenberg sandy loam, 0-3 percent slopes
- Haverson loam, 0-3 percent, slopes
- Typic Fluvaquents

Soils developing predominantly in alluvial or colluvial fan deposits

- Absted-Arvada-Bone complex, 0-6 percent slopes (hydric in depressions)
- Ft. Collins, loam, 0-3 percent slopes
- Ft. Collins, loam, 6-9 percent slopes
- Kim loam, 0-3 percent slopes
- Kim loam, 3-6 percent slopes
- Kim loam, 6-35 percent slopes
- Kim loam, high selenium, 3-25 percent slopes
- Otero sandy loam, 3-6 percent slopes
- Ulm clay loam, 0-6 percent slopes
- Zigweid loam, 3-6 percent slopes

Soils developing predominantly in residuum on uplands

- Cushman sandy loam, 0-6 percent slopes
- Razor clay loam, 0-6 percent slopes
- Renohill clay loam, 0-6 percent slopes
- Rock outcrop-Shingle-Samsil-Tassel complex, 3-30 percent slopes
- Samsil clay, 0-15 percent slopes
- Samsil-Shingle-Worf complex, 3-15 percent slopes
- Sear-Wibaux complex, 0-15 percent slopes
- Shingle clay loam, 0-15 percent slopes
- Shingle-Samsil complex, 3-30 percent slopes
- Tassel sandy loam, 0-30 percent slopes
- Terro sandy loam, 3-9 percent slopes
- Terro-Tassel sandy loams, 3-18 percent slopes
- Thedalund clay loam, 0-6 percent slopes
- Thedalund B Shingle loams, 3-18 percent slopes
- Worf sandy loam, 0-6 percent slopes

Soils developing predominantly in eolian sand deposits

- Valent loamy sand, 0-6 percent slopes
- Vona sandy loam, 0-6 percent slopes

Table 3-1 provides the extent of six depth classes of suitable topsoil within the Horse Creek LBA Tract and a potential overstrip area that could be salvaged and used for reclamation.

Table 3-1. Acres of Topsoil Available for Reclamation within the Horse Creek LBA Tract Lease Area and the Entire Area Which Would Be Disturbed by Mining Activities

	Thickness of Suitable Topsoil (inches)											
	0		1-12		12-30		30-48		48-60		>60	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Lease Area and Disturbance Area Combined[1]	1530.86	39.8	655.46	17.0	188.35	4.9	691.63	18.0	141.88	3.7	641.82	16.7

[1] The disturbance area includes the lease area and adjacent areas which may be affected by mining this lease area as an extension of existing operations.

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An average of 2.2 ft of topsoil will be redistributed on all disturbed acres. Areas of unsuitable soils include sites with high alkalinity, salinity or clay content.

The soil depths and types on the LBA tract are similar to soils currently being salvaged and utilized for reclamation at the adjacent mine and other mines in the PRB, and the tract is expected to have an adequate quantity and quality of soil for reclamation. The site-specific soil surveys have located hydric soils and/or inclusions of hydric soils, and the presence of hydrophytic vegetation and wetland hydrology will be determined during jurisdictional wetland determinations included in the mine permit application package (see Section 3.8).

3.5 Air Quality

Wind speeds for the region average from nine to 13 miles per hour with local variations due to differences in topography. Winds are predominantly from the west and the southwest and tend to be strongest in the winter and spring and calmer in the summer. Wind velocity tends to increase during the day and decrease during the night. A wind rose along with air quality and meteorological sampling locations for the Antelope Mine are depicted on Figure 3-4.

The air quality of the PRB area is generally good with an average annual geometric mean for TSP concentrations of 15 $\mu g/m^3$ (BLM 1985). Average particle concentrations in the basin are therefore one-tenth the maximum allowable concentration in Wyoming (see Table 3-2). Visibility for more than 60 miles is common. Major reductions in visibility are generally weather-related (BLM 1985). Forest fires to the west and northwest have also impaired visibility in the PRB in past years.

The basic regulatory framework governing air quality in Wyoming is the Wyoming Environmental Quality Act, the accompanying Air Quality Standards and Regulations promulgated by the Wyoming Environmental Quality Council, and the State Implementation Plan approved by the EPA under the Clean Air Act. This regulatory framework includes state air quality standards, which must be at least as stringent as National Ambient Air Quality Standards, and allowable increments for the prevention of significant deterioration of air quality.

The PSD program is designed to protect air quality from significant deterioration in areas already meeting state standards. In other words, an increase in ambient air pollutant concentrations, above the area baseline, is allowable if the state standard increment for the pollutant is not exceeded for the area. The increment allowable under PSD depends on the area's designation as Class I, II, or III. Class I areas are allowed the smallest increment and Class III the largest. The area the coal mines are located in is Class II, as is all of Wyoming outside the national parks and wilderness areas.

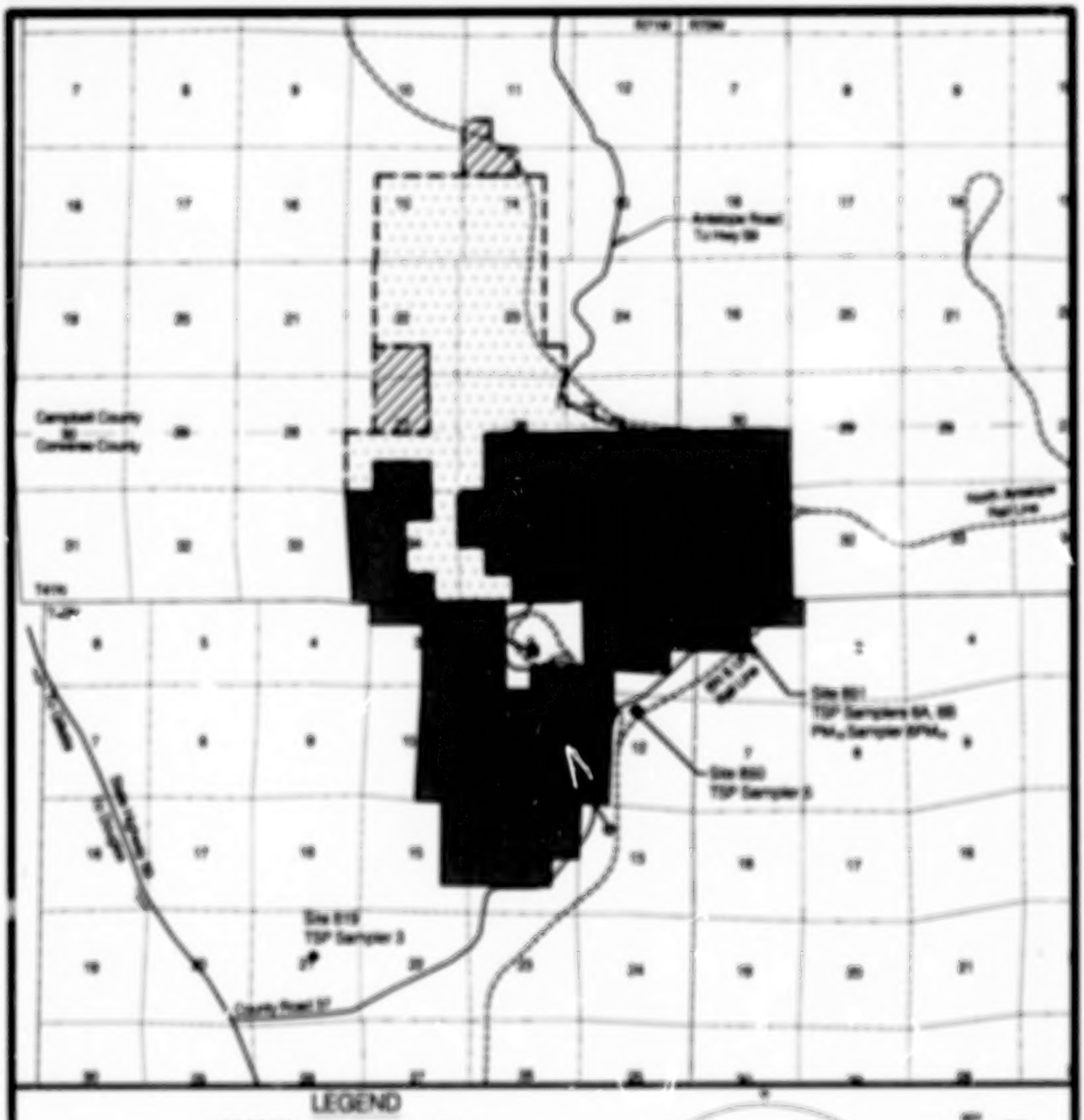

Figure 3-4. Wind Rose, Air Quality and Meteorological Stations at the Antelope Mine.

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Table 3-2. Regulated Air Emissions for Wyoming

Emissions	Averaging Period	Wyoming Standard ($\mu g/m^3$)	National Standard ($\mu g/m^3$)
Total Suspended Particles	24-hour[1]	150	---
PM_{10}	24-hour[1]	150	150
	annual[2]	50	50
Nitrogen Oxide (NO_x)	annual[2]	100	100
Photochemical Oxidant (O_3)	1-hour[1]	160	235
Sulfur Dioxide (SO_2)	3-hour[1]	1,300	---
	24-hour[1]	260	365
	annual[2]	60	80
Carbon Monoxide (CO)	1-hour[1]	40,000	40,000
	8-hour[1]	10,000	10,000

[1] Standards not to be exceeded more than once per year.

[2] Annual arithmetic mean not to be exceeded.

The major type of emissions from surface coal mining activities is fugitive dust. Blasting and moving overburden, crushing, loading, and hauling coal, and the large areas of

The Class I area that is closest to the Horse Creek LBA Tract is Wind Cave National Park in southwestern South Dakota. This national park is approximately 80 miles east of the LBA tract. The next closest Class I area, according to DEQ, Cloud Peak is Class II Badlands National Park, which is some 120 miles east of the Horse Creek Tract.

Wyoming's PSD standards for particles are identical to federal standards, except that Wyoming has not adopted Class III standards (see Table 3-3). Coal mining around the Horse Creek LBA Tract is not currently affected by the PSD regulations because surface coal mines are not one of the 28 EPA-listed major emitting facilities for PSD regulation, and point-source emissions from these mines do not exceed the PSD emissions threshold for applicability of 250 tons per year.

In the vicinity of the Horse Creek LBA Tract, the main sources of air pollution are surface coal mines, vehicle traffic, and various sources associated with oil and gas production, railroad traffic and farming and ranching activities. The closest existing power plant is approximately 25 miles southwest of the tract (Dave Johnston); however, two new power plants have been proposed closer to the tract (ENCOAL-about nine miles northeast of the tract, and Two Elk-about 15 miles northeast of the tract). These plants are not currently under construction, and no construction activities are scheduled at this time for either plant.

Table 3-3. Maximum Allowable Increases for Prevention of Significant Deterioration of Air Quality: Particles

Emission	**Averaging Time**	**Maximum Allowable Increments of Deterioration ($\mu g/m^3$)** **Class I**	**Class II**	**Class III**
Total Suspended Particles (TSP)	Annual Mean	5	19	37
	24-hour[1]	10	37	75

[1] Maximum allowable increment may be exceeded once per year at any receptor site.

disturbed land all produce dust. Wyoming's ambient air standards for particles include both PM_{10} and TSP standards. PM_{10} is respirable particulate matter (less than 10 microns) which can penetrate into the lungs and cause health problems. TSP is total suspended particles. The current Wyoming and National standards for PM_{10} and TSP are shown in Table 3-2.

Vehicle traffic, both inside and outside the areas of surface coal mining, is responsible for tailpipe emissions and for the emission of fugitive dust from paved and unpaved surfaces. Vehicle emissions consist primarily of nitrogen oxides (NO_x) and carbon monoxide (CO), but also may include sulfur dioxide (SO_2) and, by secondary processes, ozone (O_3). The national and state standards for emissions of these substances are also shown in Table 3-2.

The compressor stations and large generators associated with oil and gas production and transport and with fossil fuel-fired power plants produce emissions of NO_x, SO_2, CO, TSP, PM_{10}, volatile organic compounds, and smaller amount of other pollutants.

The main pollutant of concern associated with the locomotives used to haul the coal and other commodities is NO_x. The main pollutants produced by farming and ranching activities are dust and NO_x.

In order to obtain a state air quality construction and operating permit, each mine may be required to demonstrate, through dispersion modeling, that its activities will not increase PM_{10} levels above the annual standard established by the Wyoming Air Quality Standards and Regulations (WDEQ/AQD 1995). The modeling demonstration must include the estimated air pollutant emissions from other existing pollution-generating activities, including adjacent mines, so that control of overall air quality is part of the permitting process.

WDEQ/AQD has presented testimony in public hearings documenting that the air quality resource in the region including the Horse Creek LBA Tract did not diminish from 1980 through 1988, although coal production in the region increased substantially during that period. Air quality particle data from that report is summarized in Table 3-4. To summarize the monitoring data in comparative form, averages of the geometric means from all sites were calculated for each calendar year. Over 23,000 samples are represented in Table 3-4. The information presented by the WDEQ/AQD shows that air quality in the Wyoming portion of the PRB did not deteriorate while coal production increased nearly 2.5 times in the 1980-1988 period. This is due in part to the conditions attached to air quality permits. These conditions stipulate control measures that must be implemented by the mine operators to meet air quality standards. These measures include increased sprinkling, use of approved chemicals to control dust, limiting the amount of disturbed area, temporary vegetation of disturbed areas, and contemporaneous reclamation. In the mining areas immediately adjacent to the Horse Creek LBA Tract, historical particle ambient air quality data show the same result for the Antelope Mine as described above for the PRB as a whole. Figure 3-5 presents

Table 3-4. Summary of WDEQ/AQD Report on Air Quality Monitoring in Wyoming's Powder River Basin, 1980-1988

Year	Number of Mines Producing/ Monitoring[1]	# Sites[2]	Coal Produced (MMTPY)	Overburden (MMBCY)	TSP Average of All Geometric Means (µg/m^3)
1980	10/12	29	58.8	93.2	30.8
1981	11/13	34	68.9	108.0	30.4
1982	11/15	43	81.4	120.7	23.1
1983	13/15	41	88.0	157.2	24.3
1984	4/15	4[illegible]	106.8	166.6	24.3
1985	16/15	45	113.8	196.3	24.3
1986	16/16	46	114.6	169.6	20.5
1987	16/16	45	124.6	180.9	25.6
1988	16/16	[illegible]5	139.1	209.8	29.3

Notes: [1] Mines include Buckskin, Rawhide, Eagle Butte, Fort Union, Clovis Point, Wyodak, Caballo, Belle Ayr, Caballo Rojo, Cordero, Coal Creek, Jacobs Ranch, Black Thunder, North Antelope/Rochelle, Antelope, and North Rochelle.

[2] Some sites include more than one sampler, so the number of samplers is greater than the number of sites.

Source: From WDEQ/AQD 1989 (This study has not been updated).

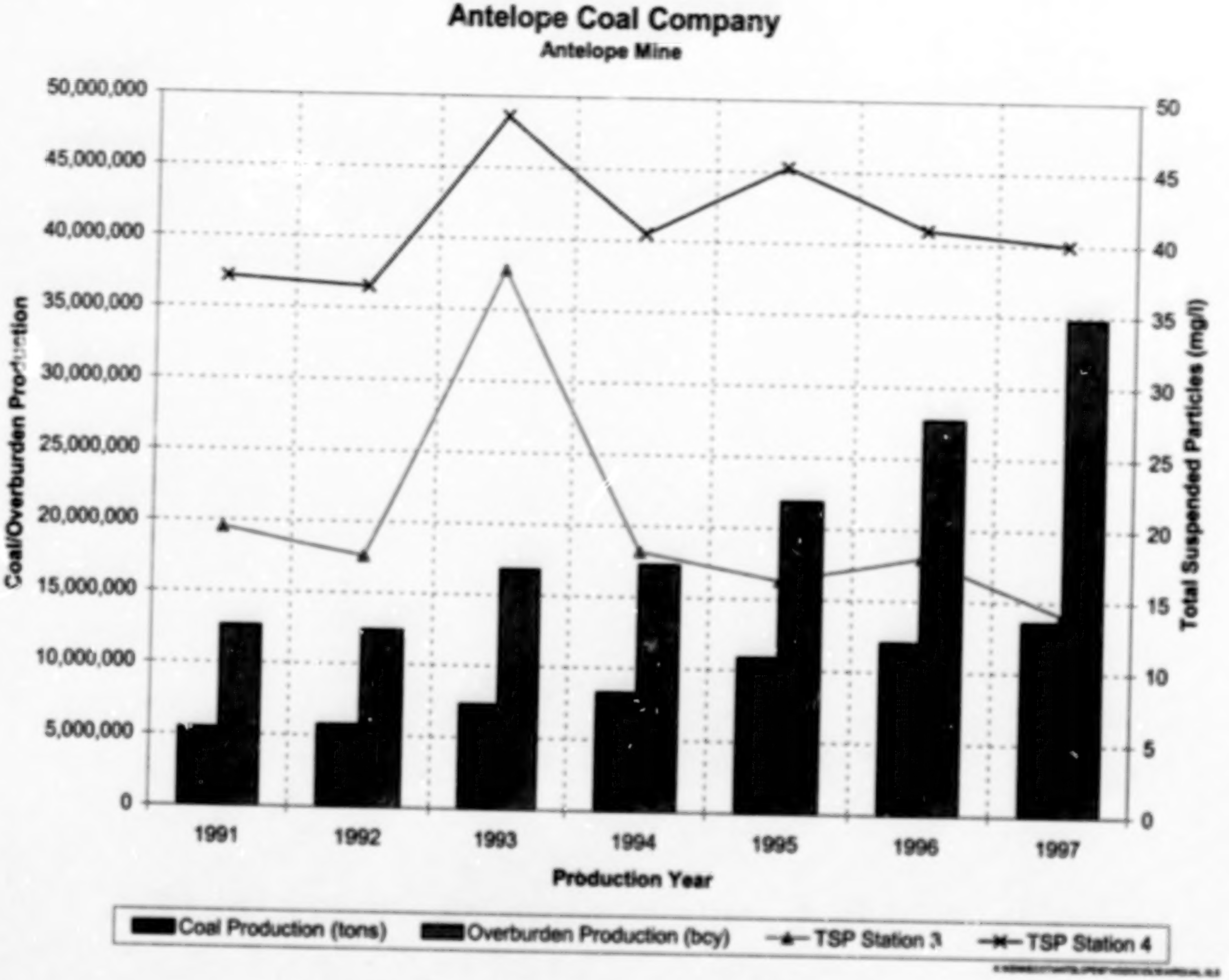

Figure 3-5. Coal Production and Overburden Removal vs. Ambient Total Suspended Particle Concentrations for Antelope Mine.

particle ambient air data and mine coal and overburden quantities for the years 1991 through 1997 for the Antelope Mine. As the figure illustrates, substantial increases of coal production and overburden handled by the mine have not been accompanied by any increase in ambient concentrations of TSP.

Before adoption of the current annual PM_{10} standard, the annual particulate standard was 60 $\mu g/m^3$ of TSP (geometric mean). As Figure 3-5 shows, the annual TSP average at the Antelope Mine has been well below this former standard. Assuming that PM_{10} (which was not monitored during the years at all the sites shown in the figure) was about 30 percent of the TSP values (as determined by the WDEQ/AQD based on many years of results from co-located TSP and PM_{10} samplers), and assuming that the geometric and arithmetic means of TSP data are similar, it can be inferred from Figure 3-5 that the Antelope Mine would have historically been well within the current annual PM_{10} standard of 50 $\mu g/m^3$.

The 1991-1997 TSP data from samples collected at the Antelope Mine indicate that emissions have not caused any violation of the current standard. From 1991 to 1997, the TSP arithmetic means for the Antelope Mine at TSP stations 3 and 4, in micrograms per cubic meter, are as follows: 1991 = 28.3; 1992 = 27.0; 1993 = 43.2; 1994 = 29.4; 1995 = 31.3; 1996 = 29.5; and 1997 = 27.0 (ACC Annual Reports 1991-1997).

Nitrogen dioxide (NO_2) was monitored from 1975 through 1983 and from March 1996 through May 1997 in Gillette, Wyoming. NO_2 data has also been collected at some of the mines in recent years. Table 3-5 summarizes the results of that monitoring. The Horse Creek LBA Tract is located approximately 60 miles south of Gillette. In addition to being a populated area, Gillette is also in close proximity to several coal mines, so the NO_2 levels in the Gillette area would be expected to reflect the influence of surface coal mining as well as more traffic than would be expected in the area of the Horse Creek LBA Tract.

3.6 Water Resources

3.6.1 Groundwater

Within the Horse Creek LBA Tract there are four water-bearing geologic units that could be disturbed by mining. In descending order, these units are: Recent alluvium that occurs in varying amounts adjacent to the stream channels within the LBA tract, the Wasatch Formation overburden and the Anderson and Canyon coal seams (the interburden between the Anderson and Canyon coal seams is not considered an aquifer). The sub-coal Fort Union Formation and the underlying Lance Formation are utilized for water supply at the Antelope Mine and the North Antelope/Rochelle Complex, but will not be disturbed by mining activities. The stratigraphic units beneath the Horse Creek LBA Tract and the hydrologic properties are displayed in Figure 3-3.

Table 3-5. Ambient NO_2 Concentration Data

Year	NO_2 Arithmetic Average ($\mu g/m^3$)		
	Gillette	Black Thunder Mine	Belle Ayr Mine
1975	6		
1976	4		
1977	4		
1978	11		
1979	11		
1980	12		
1981	14		
1982	11		
1983[1]	17		
1996[2]	13	13	16
1997[3]	28	23	33

[1] Monitoring discontinued December 1983, reactivated March 1996 to April 1997.

[2] 1996 arithmetic average-March to December

[3] 1997 arithmetic average-January to April

Source: Wyoming Ambient Air Monitoring Data, 1997. Wyoming Department of Environmental Quality.

ACC has collected hydrogeologic data at the LBA tract from monitoring wells shown on Figure 3-6. In addition to 16 shallow monitoring wells completed in the alluvium of Horse Creek, the Horse Creek LBA Tract contains 21 bedrock monitoring wells; four are completed in the overburden, five in the Anderson coal seam, three in the interburden between the Anderson and Canyon coal seams, five in the Canyon coal seam, three in the Anderson/Canyon seam where there is no parting, and one in the underburden beneath the coal. Data from these wells, as well as previously collected data at the Antelope Mine, were used to prepare the following description of baseline groundwater conditions within the LBA tract.

Recent Alluvium

Alluvium is present adjacent to both Horse Creek and Antelope Creek within the LBA tract. The alluvium along Antelope Creek ranges from 800

82

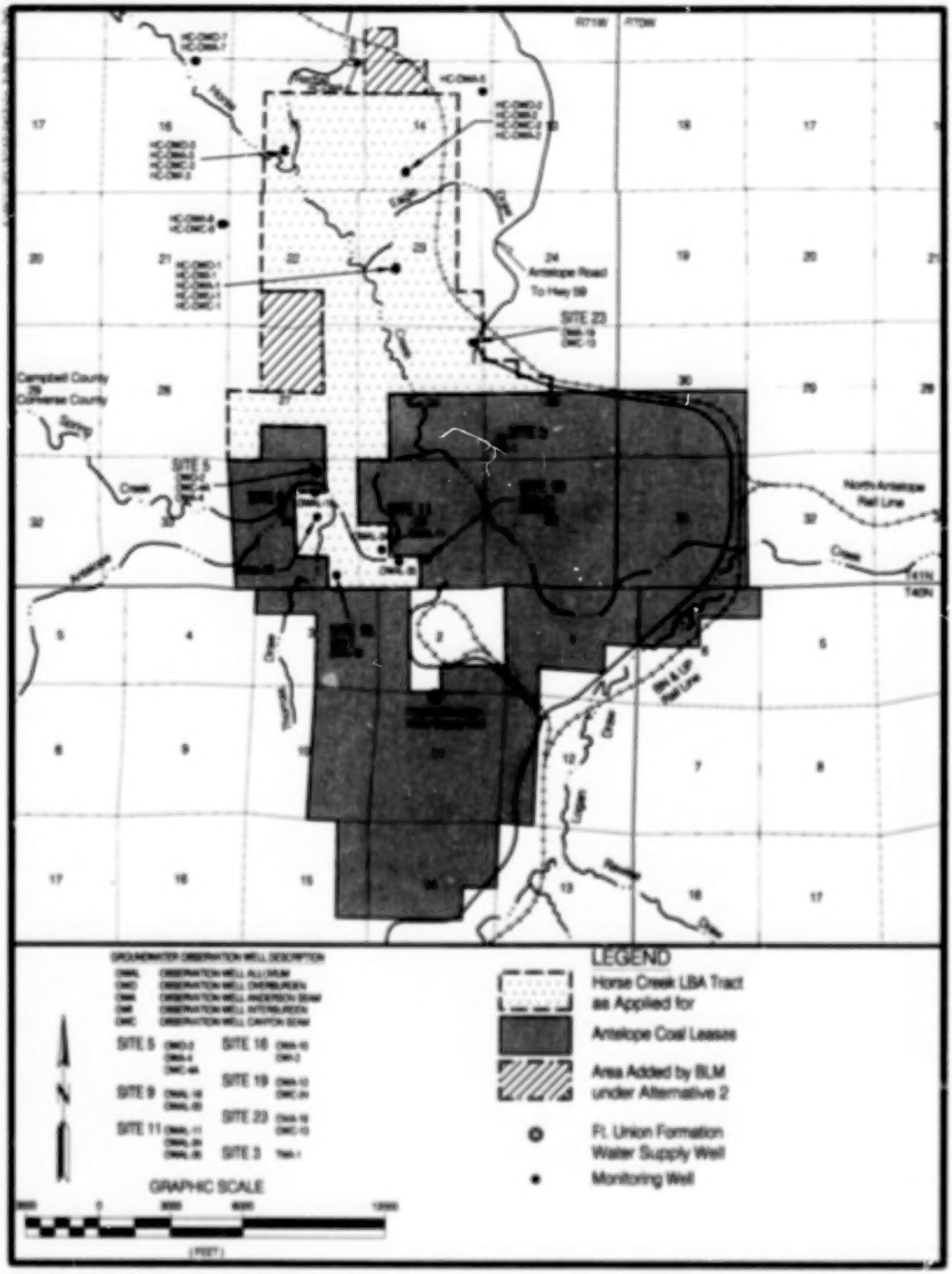

Figure 3-6. Monitoring and Water Supply Well Locations within and adjacent to the Horse Creek LBA Tract.

83

to 2,800 ft wide and is comprised of up to 40 ft of saturated sand and some gravel with numerous lenses or layers of clay and silt. The alluvium within the LBA tract along Horse Creek is up to 600 ft wide, ranges from five to 15 ft in depth and is typically composed of silty to clayey sand.

The hydraulic properties of the alluvium are variable, with the Antelope Creek alluvium hydraulic conductivity values ranging from 27 to 42 ft/day; the Horse Creek alluvium hydraulic conductivity values range from 0.4 to 2 ft/day.

Water quality data from wells completed in the alluvium of Horse Creek within the LBA tract indicate that TDS concentrations range from 3,064 to 12,204 mg/L with a mean of 5,942 mg/L (Environmental Design Engineering 1998). In general, TDS concentrations in the Horse Creek alluvium increase in the downstream direction. The Horse Creek alluvial groundwater is of the calcium-magnesium sodium-sulfate type. TDS concentrations of groundwater within the Antelope Creek alluvium range from 582 mg/L to 5,408 mg/L and average 3,355 mg/L. The Antelope Creek alluvial groundwater is typically of the calcium-sodium sulfate type where the alluvium is in connection with the Anderson Coal seam.

Wasatch Formation

Within the PRB the Wasatch Formation consists of interbedded sandstones, siltstones and shale with occasional discontinuous coal stringers and clinker deposits, and this description holds true for the LBA tract. The sandstone and coal stringers, where saturated, will yield water to wells, and this groundwater is often used for stock watering. Because the sandstone and coal aquifer units within the Wasatch Formation are not continuous, the Wasatch is not considered to be a regional aquifer.

Recharge to the Wasatch Formation is from the infiltration of precipitation and lateral movement of water from adjacent clinker bodies. Regionally, groundwater is discharged from the Wasatch Formation by evaporation and transpiration, by pumping wells, and by seepage into the alluvium along stream drainages. For the Wasatch Formation as a whole, the discontinuous nature of the water bearing units results in low overall hydraulic conductivity and low groundwater flow rates. Because of the varied nature of the aquifer units within the Wasatch, hydraulic properties are variable as well. Martin, et al. (1988) reported that hydraulic conductivities within the Wasatch ranged from 10^{-4} ft/day to 10^{-2} ft/day and the geometric mean hydraulic conductivity based on 203 tests was 0.2 ft/day. The geometric mean hydraulic conductivity from 70 aquifer tests using wells completed in sandstone in the Wasatch overburden was 0.35 ft/day, while that from 63 aquifer tests completed in siltstone and claystone in the Wasatch overburden was 0.007 ft/day (Rehm et al. 1980). The Wasatch Formation within the Horse Creek LBA Tract is similar to this latter figure in that there is relatively little saturated sand present within the low-permeability silts and clays that make up most of the overburden.

Water quality in the Wasatch Formation is variable, with TDS concentrations ranging from 511 mg/L to 1,151 mg/L in the vicinity of the LBA tract. Groundwater from the Wasatch Formation is of the sodium-calcium sulfate type within the Horse Creek LBA Tract.

Wyodak Coal

Due to its continuity, the Wyodak coal seam is considered a regional aquifer within the PRB. Within the Horse Creek LBA Tract, partings separate the Wyodak into the Anderson and Canyon seams.

Hydraulic conductivity within the Anderson and Canyon coal seams is highly variable and is reflective of the amount of fracturing the coal has undergone, as unfractured coal is virtually impermeable. The yield of groundwater to wells and mine pits is smallest where the permeability of the coal is derived primarily from localized unloading fractures. These fractures, which are the most common, were created by the expansion of the coal as the weight of overlying sediments was slowly removed by erosion. The highest permeability is imparted to the coal by tectonic fractures. These are through-going fractures of areal importance created during deformation of the south Powder River structural basin. The presence of these fractures can be recognized by their linear expression at the ground surface, controlling the orientation of stream drainages and topographic depressions. Due to their pronounced surface expression, these tectonic fractures are often referred to as "lineaments". Coal permeability along lineaments can be increased by orders of magnitude over that in the coal fractured by unloading only.

Aquifer tests have been performed by ACC on the Anderson and Canyon coal seams within and adjacent to the Horse Creek LBA Tract. Average coal permeability in the vicinity of the LBA tract is approximately 12.4 ft/day in the Anderson coal and 6.9 ft/day in the Canyon coal.

The Anderson and Canyon coal seams are confined at the LBA tract, which results in low storage coefficients. Measured storage coefficient values in the vicinity of the Horse Creek LBA Tract range from 1.3×10^{-4} to 1.6×10^{-5} in the Anderson coal and 1.1×10^{-5} to 2.7×10^{-5} in the Canyon coal.

Groundwater in the Anderson coal seam in the Antelope Mine area is typically of the sodium sulfate type; groundwater at Well TWA-1, located at monitoring site 3 (see Figure 3-6 for location) is of the sodium bicarbonate type. TDS concentrations range from over 2,000 mg/L in the sodium sulfate type water to less than 100 mg/L in the sodium bicarbonate type water (ACC 1995).

Water quality in the Canyon coal seam is similar to that of the

Anderson seam. Groundwater from the Anderson seam is typically of the sodium-bicarbonate type. Baseline TDS concentrations range from 400 to 1,600 mg/L.

Groundwater in the interburden between the Anderson and Canyon coal seams is of the sodium bicarbonate type with TDS concentrations ranging from 612 to 1,068 mg/L.

Prior to mining, the direction of groundwater flow within the coal aquifer was generally from recharge areas near the outcrop into the basin, following the dip of the coal. Site-specific water-level data collected by ACC in the vicinity of the LBA tract and presented in the GAGMO 15-year report (Hydro Engineering 1996a) indicate that the groundwater flow directions have been influenced by mining activities. Groundwater flow within the coal aquifer in the vicinity of the LBA tract is now toward nearby mine pits.

Subcoal Fort Union Formation

The subcoal Fort Union Formation can be divided into three hydrologic units: the Tongue River aquifer, the Lebo Member, and the Tullock aquifer (Law 1976). The hydrologic units below the coal are not directly disturbed by mining, but many mines use them for water supply wells. The Tongue River aquifer consists of lenticular fine-grained shale and sandstone. The Lebo Member, also referred to as "the Lebo Confining Layer," is typically more fine-grained than the other two members and generally retards the movement of water (Lewis and Hotchkiss 1981). The Tullock aquifer consists of discontinuous lenses of sandstone separated by interbedded shale and siltstone. Transmissivity is the product of an aquifer's hydraulic conductivity or permeability times it thickness and is commonly used when discussing the hydraulic properties of the Fort Union Formation, where wells are completed by exposing many discrete sand lenses to the well bore. Transmissivities are generally higher in the deeper Tullock aquifer than in the Tongue River or Lebo, and many mines in the PRB have water-supply wells completed in this interval (Martin et al. 1988). The average transmissivity for this member as reported in McIntosh, et al. (1984) is 290 ft^2/day.

In the vicinity of the Horse Creek LBA Tract, the Tongue River aquifer consists of alternating sandstones, siltstones, and claystones. Measured permeabilities of this sequence are low, averaging approximately 0.6 ft/day (PRCC 1993). A Fort Union Formation well is used for mine water supply at the Antelope Mine. Water supply well WS-1 is completed to a total depth of 2,528 feet and has eight screened intervals between a depth of 1,436 ft and the bottom of the well. WS-1 is screened in the Tullock Member. In 1997, the production was 33.2 million gallons. The well's location is depicted on Figure 3-6.

The water quality of the Fort Union Formation is generally good. TDS concentrations measured at Antelope

Mine water supply well WS-1 average about 520 mg/L. Water from this well is of the sodium bicarbonate type.

Lance and Fox Hills Formations

Underlying the Fort Union Formation is the Lance Formation of Cretaceous age. At the base of the Lance Formation is the Fox Hills Sandstone. The Lance and Fox Hills formations are not used by ACC at Antelope Mine. Water from the Fox Hills Sandstone and overlying Lance Formation are utilized for water supply at PRCC's Rochelle mine by a 5,400-ft deep well located approximately 6 miles from the Horse Creek LBA Tract. Water from this well is of the sodium bicarbonate type, with a TDS concentration of about 1,200 mg/L.

3.6.2 Surface Water

The area surrounding the Horse Creek LBA Tract consists of gently rolling topography. In general, the streams within this area are typical for the region, and their flow events are closely reflective of precipitation patterns. Flow events frequently result from snowmelt during the late winter and early spring. Although peak discharges from such events are generally small, the duration and therefore percentage of annual runoff volume can be considerable. During the spring, general storms (both rain and snow) increase soil moisture, hence decreasing infiltration capacity, and subsequent rainstorms can result in both large runoff volumes and high peak discharges. The surface water quality varies with streamflow rate; the higher the flow rate, the lower the TDS concentration but the higher the suspended solids concentration. Surface water features within and adjacent to the Horse Creek LBA Tract are displayed in Figure 3-7.

The LBA tract is located within the Cheyenne River drainage basin. The Horse Creek LBA Tract includes a small portion of the valley of Antelope Creek and the upper reaches of Horse Creek, a southward-flowing tributary of Antelope Creek. A short reach of Antelope Creek crosses the LBA tract and drains eastward toward the Cheyenne River. In the vicinity of the LBA, Antelope Creek is a meandering, braided intermittent stream into which flow small, gullied ephemeral streams. Antelope Creek has an approximate gradient of 0.3 percent and a 17-year average discharge (1981-1997) of 3.0 ft^3/second. Annual streamflow data reveal a 17-year average runoff volume of 2,826 ac-ft in Antelope Creek at the west permit boundary and an average of 2,234 ac-ft at the east permit boundary (ACC 1997). These figures indicate that Antelope Creek loses approximately 10.1 percent of its flow as it crosses Antelope Mine. Streamflow is lost to alluvial recharge and evapotranspiration (ACC 1997). The water in Antelope Creek and other local channels comes from three general sources: 1) groundwater contained in the shallow alluvial aquifer, 2) lateral inflow of groundwater from surrounding bedrock, and 3) surface water from the watershed upstream.

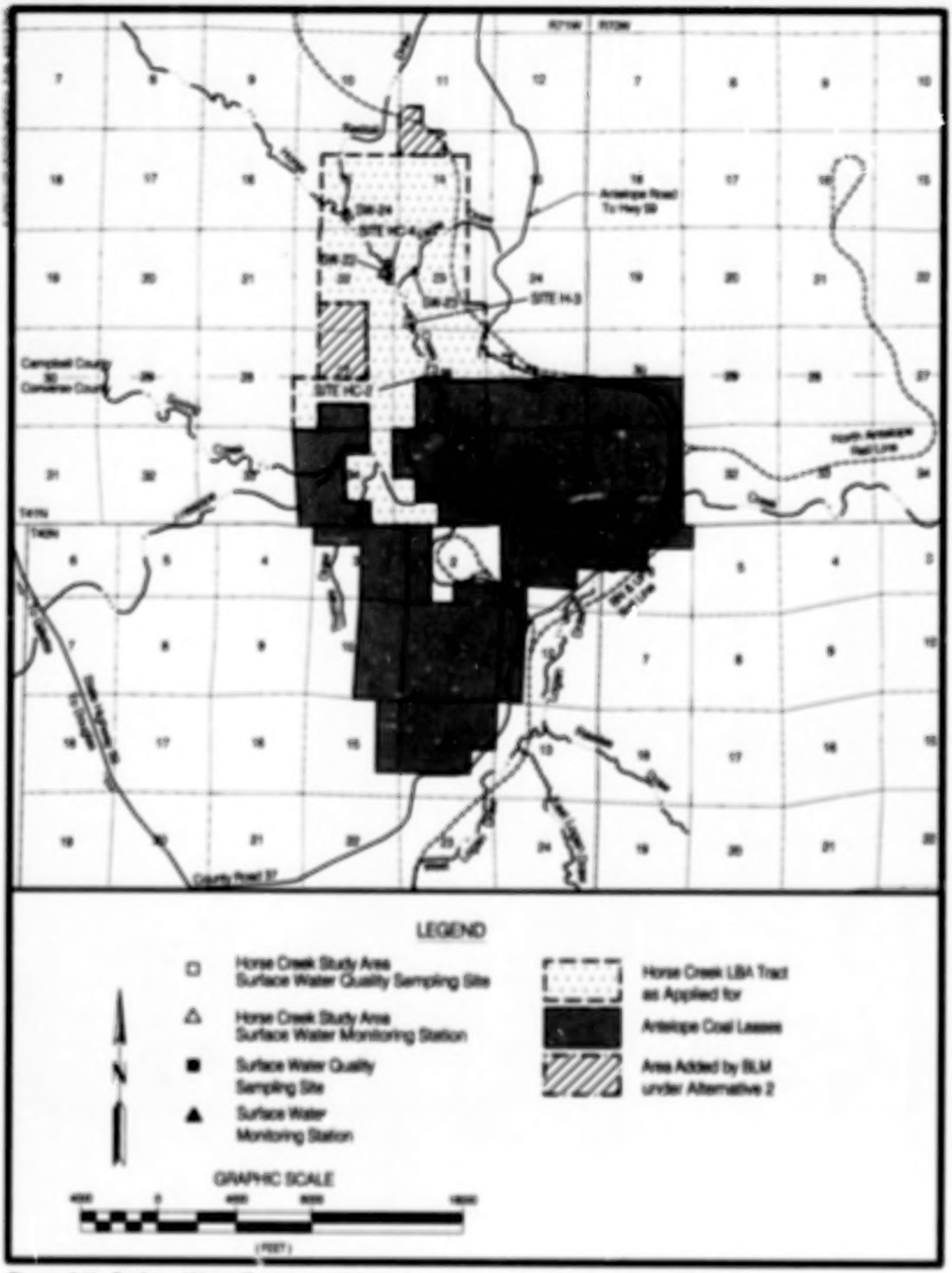
R71W R70W
Antelope Road To Hwy 59
SW-24
SITE HC-4
SW-22
SW-23
SITE H-3
SITE HC-2
Campbell County
Converse County
North Antelope Rail Line
T41N
T40N
County Road 37
LEGEND
□ Horse Creek Study Area Surface Water Quality Sampling Site
△ Horse Creek Study Area Surface Water Monitoring Station
■ Surface Water Quality Sampling Site
▲ Surface Water Monitoring Station
Horse Creek LBA Tract as Applied for
Antelope Coal Leases
Area Added by BLM under Alternative 2
N
GRAPHIC SCALE
400
0
400
800
1600
(FEET)

Figure 3-7. Surface Water Features within and adjacent to the Horse Creek LBA Tract.

Flow in Antelope Creek during the winter months is very low, and the stream often has no flow due to freezing. In the early spring, Antelope Creek begins flow in response to ice breakup and snowmelt runoff. The majority of this flow is from upstream drainage with a small percentage of runoff being contributed locally. A small springtime base flow in Antelope Creek occurs from discharging groundwater from the Anderson coal seam in the drainage upstream of Antelope Mine. The total discharge of groundwater from the Anderson coal seam to Antelope Creek or its alluvium in the Antelope Mine vicinity is estimated at 129 ac-ft/yr (80 gpm) (ACC Mine Permit Document, October 1993, Vol. VII, Appendix D6, Hydrology). This discharge is not sufficient to overcome consumptive uses during the summer time, and therefore the stream has extended no-flow periods during each year.

Antelope Creek has a drainage area of approximately 854 mi^2 above the Antelope Mine (ACC 1995). The existing permit area consists of 7,683.29 acres, or about one percent of the Antelope Creek drainage area at this location. The LBA tract comprises an additional 2,837.9 acres, or about half of one percent of the drainage area of Antelope Creek at this location.

Horse Creek has a drainage area of about 15 mi^2. This stream is classified as ephemeral, flowing only in direct response to snowmelt or rainfall runoff events. Average annual runoff near its confluence with Antelope Creek is 140 ac-ft/yr for the years 1991 through 1996. In 1997 an anomalously large runoff volume of 3,134 ac-ft was measured (ACC 1997). This stream is typical of small ephemeral drainages for the region, and flow events are closely reflective of precipitation patterns. Flow events of relatively small magnitude can result from snowmelt during the late winter and early spring. Although peak discharges from such events are small, the duration and therefore percentage of annual runoff volume can be considerable.

A search of the records of the Wyoming State Engineer indicates no permitted ponds or reservoirs are located within the LBA tract. The only ponds on the tract are pools in the Horse Creek channel that contain water during wet periods.

Flows and water quality in Antelope Creek and several minor tributaries are monitored on and near the permit area and reported annually. The surface water quality varies with stream flow rate; the higher the flow rate, the lower the TDS concentration but the higher the suspended solids concentration. The surface water of Antelope Creek is generally classified as a calcium-sulfate type, except in areas of coal seam discharge where the water shifts toward a sodium-sulfate type, especially during periods of low flow. TDS concentrations are reduced where the coal seams are discharging to Antelope Creek. The surface water is typically a calcium-sodium-sulfate water and generally contains more than 1,500 mg/L of

TDS. This water is usually unsuitable for domestic use, marginal for irrigation, and suitable for stock and wildlife (OSM 1981). The surface water in Horse Creek is also typically of the calcium-magnesium-sodium-sulfate type. TDS concentrations range from 1,020 to 5,888 mg/L and average 3,507 mg/L.

3.6.3 Water Rights

Records of the SEO were searched for groundwater rights within a 3-mile radius of the Horse Creek LBA Tract, as required for WDEQ permitting. SEO data indicate there are 306 permitted water wells within three miles of the tract. The majority of these wells (258) are owned by coal mining companies. Of the 48 other wells, 38 are permitted for stock watering purposes, five are permitted for domestic and/or stock use, one for industrial purposes, and four for monitoring or miscellaneous use. A listing of the 48 non-coal wells is presented in Appendix E.

SEO records were searched for surface water rights using the SEO's AREV program. The search was conducted for surface-water rights within one-half mile of the tract and three miles downstream from the tract, as required for WDEQ permitting.

SEO records indicate 36 permitted surface water rights within the search area for the LBA tract. The majority of the surface water rights (31) are held by coal mining companies. The five other surface water rights are for stock watering and are listed in Appendix E.

3.7 Alluvial Valley Floors

WDEQ regulations define AVF's as unconsolidated stream laid deposits where water availability is sufficient for subirrigation or flood irrigation agricultural activities. Prior to leasing and mining, AVF's must be identified because their presence can restrict mining activities. Impacts to designated AVF's are generally not permitted if the AVF is determined to be significant to agriculture. If the AVF is determined not to be significant to agriculture, or if the permit to affect the AVF was issued prior to the effective date of SMCRA, the AVF can be disturbed during mining but must be restored as part of the reclamation process. The determination of significance to agriculture is made by WDEQ/LQD, and it is based on specific calculations related to the production of crops or forage on the AVF and the size of the existing agricultural operations on the land of which the AVF is a part.

Investigations have been conducted by ACC to determine the presence of AVF's within the existing Antelope Mine permit area. Antelope Creek within the Antelope Mine permit area, including a portion of the Horse Creek LBA Tract, has been investigated for the presence of an AVF (ACC 1995). A portion of Antelope Creek within the permit boundary has been designated by WDEQ/LQD as "possible sub-irrigated AVF of minor importance to agriculture." The reach of Horse Creek within and adjacent to the Antelope Mine permit area has also been investigated for the presence of an AVF. A narrow band adjacent to the channel and extending two miles upstream from the existing permit boundary has received AVF designation by WDEQ/LQD. The area adjacent to Horse Creek upstream of the designated AVF is currently being studied by ACC for the presence of AVF's. This investigation is a requirement for a mine permit. Preliminary findings made by WDEQ/LQD indicate that potential AVF areas located adjacent to Horse Creek do not meet AVF criteria for agricultural significance and therefore there is no prohibition on mining in the drainage under AVF regulations. The studies being undertaken by ACC will identify hydrologic functions which must be restored if the area is mined and reclaimed.

3.8 Wetlands

Waters of the U.S. is a collective term for all areas subject to regulation by the U.S. Army Corps of Engineers (COE) under Section 404 of the Clean Water Act. *Waters of the U.S.* include *special aquatic sites*, wetlands, and jurisdictional wetlands. *Special aquatic sites* are large or small geographic areas that possess special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values (40 CFR 230.3). Wetlands are a type of *special aquatic site* which include "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (33 CFR 328.3(a)(7)(b)). Jurisdictional wetlands are defined by 33 CFR 328.1 and .2 as "those wetlands which are within the extent of COE regulatory review." They must contain three components: hydric soils, a dominance of hydrophytic plants, and wetland hydrology.

Many wetland scientists consider areas that contain only one of the three criteria listed above as functional wetlands. The USFWS used this categorization in producing the National Wetlands Inventory maps. These maps were produced using aerial photo interpretation, with limited field verification.

The presence of wetlands on a mine property does not preclude mining. Jurisdictional wetlands must be identified and special permitting procedures are required to assure that after mining there will be no net loss of wetlands. A wetland delineation must be completed according to approved procedures (COE 1987) and submitted to the COE for verification as to the amounts and types of jurisdictional wetlands present. In Wyoming, once the delineation has been verified, it is made a part of the mine permit document. The reclamation plan is then revised to incorporate at least an equal type and number of jurisdictional wetlands. Section 404 does not cover functional wetlands. They may be restored as required by the surface managing agency (on public land) or by the private landowner. There is no public land included in the Horse Creek LBA Tract.

ACC completed a wetlands inventory of the Horse Creek LBA Tract and it was submitted to COE on March 15, 1999. Of the 3,187 acres surveyed, 15.3 acres of marsh, 41.2 acres of wet meadow, and 1.3 acres of open water were delineated.

3.9 Vegetation

ACC completed a vegetation baseline study on the existing permit area in 1978 and 1979. The baseline study buffer area encompassed the southern portion of the Horse Creek LBA Tract. The vegetation communities in this area were delineated, mapped, and sampled in accordance with the current WDEQ/LQD Guideline 2. In 1997 and 1998, preliminary vegetation communities were delineated and a preliminary vegetation map was completed for the remainder of the Horse Creek LBA Tract. Final studies of the tract and buffer area will be completed in 1999 in accordance with WDEQ/LQD Rules and Regulations in preparation of a revision to the ACC mine permit. The study areas for this vegetation study include the LBA tract and a buffer area around the tract sufficient to mine and reclaim the tract as a part of the existing mine operation.

A total of six vegetation types have been preliminarily identified and mapped within the Horse Creek LBA Tract. Table 3-6 presents the acreage and percent of the area encompassed by each vegetation type within the LBA tract and buffer area. The vegetation types are: Blue Grama Upland, Blue Grama Upland/Big

Table 3-6. Vegetation Types Identified and Mapped within the Horse Creek LBA Tract and Buffer Zone

Vegetation Type	**Acres**	**Percent**
Blue Grama Upland	1,967	51.1
Blue Grama Roughland	1,286	33.4
Blue Grama Upland/Big Sagebrush	296	7.7
Grassy Bottom	96	2.5
Jurisdictional Wetlands	57	1.5
Silversage Lowland	93	2.4
Treated Grazing Land	54	1.4
TOTAL	3,849	100

Sagebrush, Blue Grama Roughland, Grassy Bottom, Silversage Lowland, and Treated Grazing Land. These vegetation types are described as follows:

The **Blue Grama Upland** vegetation type is the largest mapping unit identified within the Horse Creek LBA Tract, occupying approximately 1,967 acres, or 51 percent of the LBA tract. This mixed grass vegetation type typically occurs in upland positions throughout the study area. This vegetation type occupies the moderately deep to deep, level to somewhat sloping loam, clay loam, and sandy loam soils. Major perennial species include: blue gama (*Bouteloua gracilis*), western wheatgrass (*Agropyron smithii*), needle-and-thread grass (*Stipa comata*), and plains pricklypear (*Opuntia polyacantha*). This type intersperses with the Blue Grama Roughland and Blue Grama Upland/Big Sagebrush vegetation types. Annual grasses also appear to be abundant within this type, with cheatgrass brome (*Bromus tectorum*) commonly observed.

The **Blue Grama Roughland** is the second largest mapping unit comprising approximately 1,286 acres, or 33 percent of the tract. This type is a heterogenous group of communities of the other vegetation types which are too small and irregular to map individually. It occurs on gently sloping to nearly vertical eroded upland drainages which are characterized by small, irregular topographic and soil variations. Soils locally range from shallow to deep and from clay loam to sandy loam to undeveloped rock outcrops. Small clay areas are nearly bare of any vegetation due to high sodium or salt content. Depending upon the soil, this heterogenous vegetation type commonly intersperses with and contains small inclusions of the Blue Grama Upland, Blue Grama Upland/Big Sagebrush, and Grassy Bottom vegetation types. Inclusions of the Grassy Bottom type along the narrow drainage bottoms which are too small to map are also found within this type. Predominant species include blue grama, western wheatgrass, needle-and-thread grass, big sagebrush, birdsfoot sagegrass (*Artemisia peditifida*), buckwheat (*Eriogonum* spp.), plains prickly pear, and saltbush (*Atriplex* spp.).

The **Blue Grama Upland/Big Sagebrush** type occurs on uplands and within shallow draws in the northern and western portions of the study area. This type comprises approximately 296 acres, nearly eight percent of the tract. This vegetation type occupies the moderately deep to deep, level to somewhat sloping loam and sandy loam soils. This type intersperses extensively with the Blue Grama Upland vegetation type and may be characterized as Blue Grama Upland vegetation with scattered to occasionally dense patches of sagebrush. Predominant species are big sagebrush (*Artemisia tridentata*), western wheatgrass, prairie junegrass (*Koeleria macrantha*), Sandberg bluegrass (*Poa secunda*), and needle and-thread grass. Cheatgrass brome is commonly observed in this type.

The **Grassy Bottom** vegetation type occurs in the drainage bottoms along Horse Creek and within the smaller ephemeral drainages. This vegetation type is found on typically moderate to deep clay loams, loams, and sandy loams. Predominant species include western wheatgrass, Kentucky bluegrass, and Sandberg bluegrass. Annual grasses, including cheatgrass and Japanese brome (*Bromus japonicus*), were also observed. This type encompasses about 96 acres, or 2.5 percent of the tract. Located within the Grassy Bottom vegetation type are jurisdictional wetlands, comprising an additional 15.3 acres of marsh, 41.2 acres of wet meadow, and 1.3 acre of open water. These cover types are discussed in the section on Jurisdictional Wetlands (Section 3.8) and are not considered vegetation types for sampling purposes under WDEQ/LQD regulations.

The **Silversage Lowland** is found on large alluvial terraces located along Antelope Creek. Silversage is found to a lesser extent in the southern portion of the Horse Creek drainage, although this species appears to have been locally eradicated. This type is found on about 93 acres, or about two percent of the tract. The Silversage Lowland vegetation type occurs on the deep level to sloping sands, loams, and sandy loams which are developing in stream-laid alluvium. The dominant species in this type include silver sagebrush (*Artemisia cana*), needle-and-thread grass, western wheatgrass, and blue grama. Scattered clusters of cottonwood trees (*Populus deltoides*) are included in this type. This type shows heavy grazing use as evidenced by prevalent weedy species. Adjoining vegetation types are the Grassy Bottom and Blue Grama Roughlands vegetation types.

Treated Grazing Land is present on the western portion of the Horse Creek LBA Tract. The area was burned in 1993 in order to eradicate the big sagebrush and is currently comprised primarily of typic Blue Grama Upland vegetation. This area occupies about 54 acres, or 1.4 percent of the LBA tract.

Threatened, Endangered, and Candidate Plant Species

The Endangered Species Act (16 U.S.C. 1531-1543) protects plant and animal species that are listed as T&E as well as their critical habitats. Endangered species are defined as those that are in danger of extinction throughout all or a significant portion of their range. Threatened species are those that are likely to become endangered in the foreseeable future throughout all or a significant portion of their range. An additional classification--candidate species (formerly Category 1 candidate species)--includes species for which the USFWS has sufficient data to list as T&E but for which proposed rules have not yet been issued.

In June 1995, a preliminary survey of the area by biologists from the USFS, USFWS and BLM determined that potential habitat existed along Horse Creek for Ute Ladies-tresses (*Spiranthes diluvialis*), a listed threatened plant species. In July 1995, ACC contracted the Nature Conservancy's WYNDD to conduct a survey of the previously issued Antelope LBA tract to determine if Ute Ladies-tresses was present along Horse Creek from just below the confluence of Horse and Antelope Creeks north 0.5 mi to approximately the middle of Section 26. No populations of this species were found, probably due to clayey rather than sandy soils and to the lack of alluvial benches. In addition, the site has higher vegetative cover than most *Spiranthes* sites. In the Decision Record for the Antelope LBA (signed 7/10/96), both USFS and BLM recommended that additional searches be conducted on the Antelope LBA tract for Ute Ladies-tresses prior to mining.

In September 1997, a computerized database search for T&E plants was conducted by WYNDD for the Horse Creek LBA Tract plus a one-mile buffer. No populations of *Spiranthes* were identified within the LBA tract or buffer area. In September 1998, Horse Creek and its main tributaries were surveyed north from the middle of Section 26 (where the WYNDD survey stopped) through Sections 22 and 23 and 0.25 mi into Sections 15 and 14. No individuals or populations of Ute Ladies-tresses were found. Surveys for this species and other plant species of special concern were conducted during the vegetation baseline study which was completed in summer 1999. Again, no T&E or candidate plant species were found.

3.10 Wildlife

3.10.1 Wildlife Resources

Background information on wildlife in the vicinity of the LBA tract was drawn from several sources, including: the EA for the Antelope Coal Lease Application (BLM 1995); the EIS for the Powder River and Thundercloud coal lease applications (BLM 1998); the EIS for the North Rochelle Coal Lease Application (BLM 1997); a Wyoming WYNDD search (The Nature Conservancy 1998); WGFD and USFS records; and personal contacts with WGFD, USFWS, and USFS biologists. Portions of the LBA tract were formerly USFS surface, managed as part of the TBNG. Thus, USFS data on a number of species were available for the lease vicinity.

Site-specific data for a portion of the proposed lease were obtained from sources including WDEQ/LQD permit applications and annual reports for nearby coal mines. Baseline and monitoring surveys cover large perimeters around each mine's permit area. Consequently, a substantial part of the LBA tract has been surveyed during annual wildlife monitoring for the Antelope Mine. Areas adjacent to the LBA tract were also partially covered during monitoring for North Antelope Mine. The entire LBA tract has undergone a wildlife survey which was completed in March of 1999.

The LBA tract and adjacent area consists primarily of heavily dissected uplands. Topography is mostly sloping to steeply sloping, with level to rolling areas being quite limited. Rough breaks habitat dominates the tract, particularly along Horse Creek and associated draws. This habitat is characterized by steep, sparsely-vegetated, erosive slopes. Gentler slopes support limited areas of upland grassland and sagebrush-grassland habitats. Bottomland is found along drainage channels in the LBA. All streams on the LBA tract are ephemeral or intermittent; the only ponds on the area are some persistent pools in creek channels. The only trees on the tract are cottonwood stands along Antelope Creek and isolated trees in other drainages.

3.10.2 Big Game

Three big game species occur in the vicinity of the LBA: pronghorn *(Antilocapra americana)*, mule deer *(Odocoileus hemionus)*, and white-tailed deer *(Odocoileus viriginianus)*. The WGFD has classified the entire tract as yearlong pronghorn range. The vast majority of the tract is classified as yearlong deer range; the extreme southeast corner of the LBA is considered winter/yearlong deer range. No crucial big game habitat or migration corridors are recognized by the WGFD in this area.

Pronghorn are, by far, the most common big game species in the area. The LBA tract is within pronghorn antelope Hunt Area 27, part of the Lance Creek Herd Unit. The WGFD estimated the 1998 post-season pronghorn population to be approximately 25,000-30,000; the herd objective is 27,000.

Winter pronghorn population trends in the vicinity of the proposed lease have been tracked during monitoring at Antelope and other nearby mines. The LBA is in the southwest portion of a survey block, over 225 mi^2 in size, that has been surveyed annually from 1994 through 1998. Results from those surveys indicate that pronghorn density in the survey block has been roughly six to seven animals/mi^2 except in 1996. During that year, regional numbers were temporarily depressed, presumably due to a disease outbreak in fall 1995. In the winter that followed, pronghorn density was approximately four animals/mi^2.

Pronghorn density within two miles of the LBA (a 48-mi^2 area) has been consistently lower than that of the larger survey area. From 1994 through 1998, density ranged from two to five animals/mi^2. The differences are probably due to the habitat characteristics of the proposed lease. During the winter surveys, the majority of pronghorn were observed in sagebrush-grassland and grassland habitats. These habitats occupy a small portion of the LBA tract in comparison to rough breaks. During all seasons, pronghorn tend to favor level to rolling lands and avoid rough breaks.

Mule deer are present in the vicinity of the LBA tract in relatively low numbers year-round. The tract is divided between Hunt Area 10 of the Thunder Basin Herd Unit (north of

Antelope Creek) and Hunt Area 167 of the Lance Creek Herd Unit (south of Antelope Creek). The WGFD estimated the 1998 post-season mule deer population in Hunt Area 10 at approximately 15,000, somewhat over the objective of 13,000. The estimated population in Hunt Area 167 was roughly at the objective of 18,000. Ground counts from mine monitoring data show that mule deer numbers in the vicinity of Antelope Mine (and, thus, the LBA tract) have been generally stable over the past few years. Mule deer use all habitats, although they favor rough breaks and the riparian bottomland along Antelope Creek.

White-tailed deer are not managed separately by WGFD; they are included with mule deer as part of the Thunder Basin Herd Unit. White-tailed deer are infrequently recorded in the vicinity of the proposed lease. Incidental observations are generally confined to the Antelope Creek riparian corridor.

A small, isolated population of elk *(Cervus elaphus)* resides in the Rochelle Hills, northeast of the proposed lease. No recognized elk herd units are located in the immediate vicinity of the LBA, and no elk have been recorded on or near the LBA tract.

3.10.3 Other Mammals

A variety of small and medium-sized mammal species occur in the vicinity of the LBA tract. These include predators and furbearers, such as coyote (*Canis latrans*), red fox (*Vulpes vulpes*), striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), muskrat (*Procyon lotor*) and beaver (*Castor canadensis*). Prey species include rodents (such as mice, voles, chipmunks, and prairie dogs) and lagomorphs (jackrabbits and cottontails). These species are cyclically common and widespread throughout the region. They are important prey items for raptors and other predators.

3.10.4 Raptors

A number of raptor species are known to nest in the PRB. Habitat is limited for those species that nest exclusively in trees or on cliffs, but several species are adapted to nesting on the ground, on creek banks, buttes, or rock outcrops. Figure 3-8 shows the locations of 40 raptor nests that are known to exist within two miles of the LBA tract. Most nests are those of ferruginous hawks *(Buteo regalis)*, red-tailed hawks *(Buteo jamaiscensis)*, or golden eagles *(Aquila chrysaetos)*; a few belong to great horned owls *(Bubo virginianus)* or burrowing owls *(Athene cunicularia)*. Detailed data on those raptor nests can be found in the Antelope and North Antelope mines' 1997 annual reports to WDEQ/LQD, which are included by reference into this EIS.

Only three raptor nests are located on the proposed lease; two golden eagle nests (of a single pair) and one great horned owl nest. The golden eagle pair has been regularly active and the subject of intensive monitoring and mitigation efforts since 1980. The great horned owl nest is in a territory

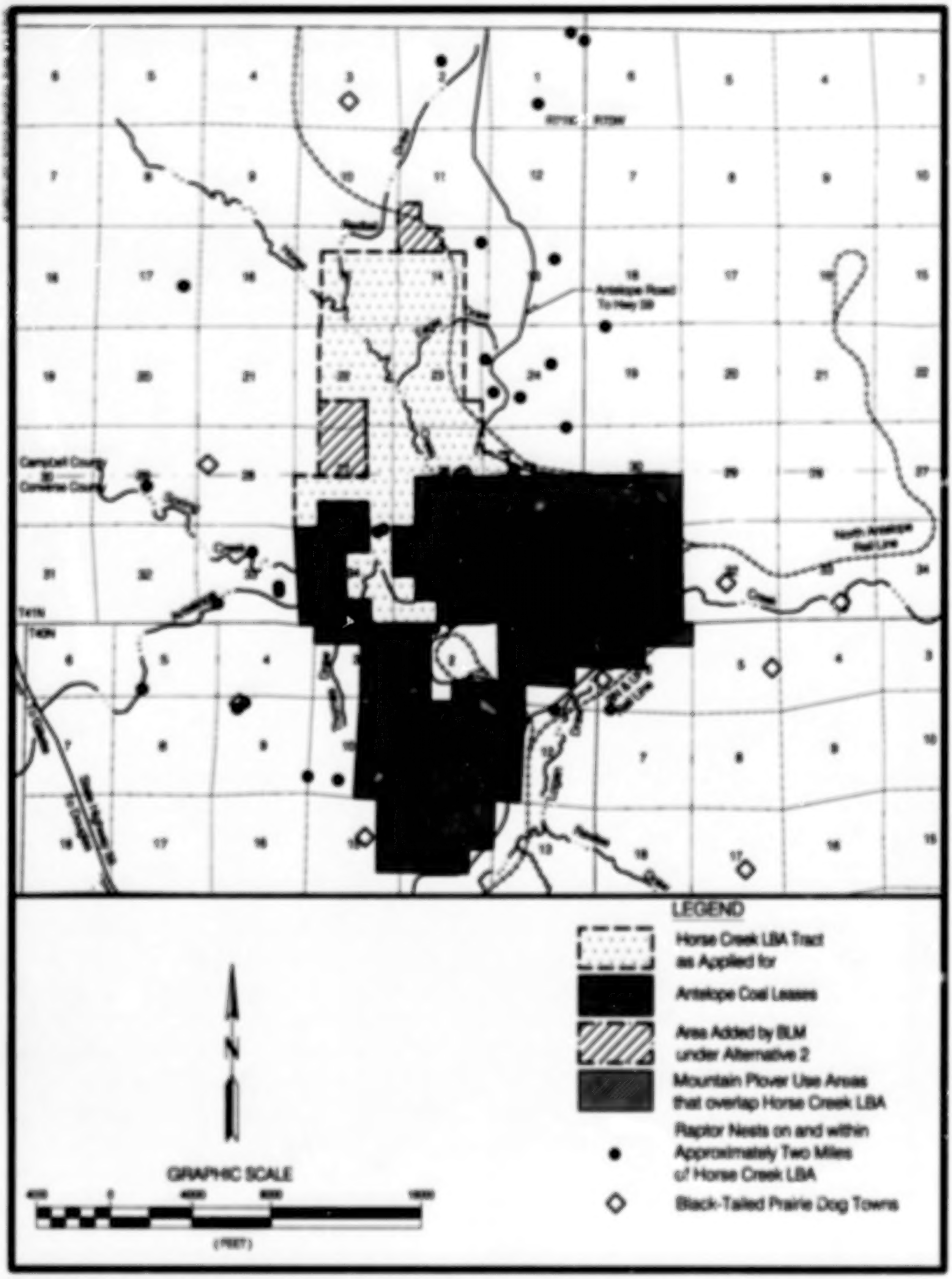
R71W R70W
Antelope Road To Hwy 59
Campbell County
Converse County
North Antelope Rail Line
T41N
T40N
N
GRAPHIC SCALE
(FEET)
LEGEND
Horse Creek LBA Tract as Applied for
Antelope Coal Leases
Area Added by BLM under Alternative 2
Mountain Plover Use Areas that overlap Horse Creek LBA
Raptor Nests on and within Approximately Two Miles of Horse Creek LBA
Black-Tailed Prairie Dog Towns

Figure 3-8. Raptor Nests, Black-Tailed Prairie Dog Towns and Mountain Plover Use Areas within and adjacent to the Horse Creek LBA Tract.

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that was active in five of the eight years from 1990 through 1997. All three nests are included in the raptor mitigation plan developed for the existing Antelope Mine. That plan has been approved by the USFWS and WDEQ/LQD. It will be updated to include the LBA tract if it is leased.

3.10.5 Game Birds

The only game birds known to occur in the vicinity of the LBA are mourning doves (*Zenaida macroura*), sage grouse (*Centrocercus urophasiauns)*, and turkeys (*Meleagris gallopavo*). Mourning doves are relatively common in the vicinity of the proposed lease, particularly near areas with trees and water sources. This species is a common summer resident in Wyoming.

Sage grouse habitat occurs throughout Wyoming and is characterized by an interspersed mosaic of sagebrush and grassland. During all seasons, sage grouse use sagebrush for cover and forage. During spring, sage grouse gather on traditional breeding grounds (leks), which are typically open areas in level to rolling terrain surrounded by denser sagebrush cover. WGFD considers the area within two miles of a lek to be nesting habitat. The majority of the LBA tract was searched for leks in 1997, during annual wildlife monitoring studies for the Antelope Mine. No leks were found on the proposed lease, and there are no records of any leks on the area. The nearest known lek is five miles southeast of the tract. Because the tract is heavily dissected by draws and dominated by sparsely-vegetated rough breaks, very little typical sage grouse habitat exists on the area. No sage grouse have been documented in any season on or near the adjacent Antelope Mine during annual monitoring.

Turkeys have occasionally been observed along Antelope Creek, generally east of the LBA tract. No recent observations have been recorded.

3.10.6 Other Avian Species

Habitats on the LBA tract would be expected to support a limited suite of avian species. Baseline studies at nearby mines show that sagebrush grasslands and clay rough breaks of the semi-arid northern Great Plains typically possess limited avian diversity. Common species in such habitats include Brewer's (*Spizella breweri*), vesper (*Pooecetes gramineus*), and lark sparrows (*Alauda arvensis*); horned larks (*Eremophila alpestris*); western meadowlarks (*Sturnella neglecta*); and lark buntings (*Calamospiza melanocorys*). Species richness is generally greatest in habitats with water and/or trees. The small amount of riparian bottomland along Antelope Creek would be expected to harbor the greatest variety of species of any habitat on the lease. Species attracted to such habitat include: eastern (*Tyrannus tyrannus*) and western (*Tyrannus verticalis*) kingbirds, yellow warblers (*Dendroica petechia*), Brewer's (*Euphagus cyanorephalus*) and red-winged

(*Agelaius phoeniceus*) blackbirds, and various woodpeckers.

Waterfowl and shorebird habitat in the vicinity of the LBA tract is limited to small stock reservoirs and mine reservoirs and bottomland along Antelope Creek and its tributaries. The tract itself lacks any reservoirs. Common dabbling duck and shorebird species are known to occur in small numbers on and near the adjacent Antelope Mine, but very little nesting activity has been documented. Lack of deep water habitat or extensive water sources on or near the LBA tract limits the species diversity of these fauna and precludes significant production.

3.10.7 Fishes

Aquatic habitat is extremely limited on the proposed lease. Antelope Creek is an intermittent stream in the reach where it crosses the lease; Horse Creek, the other principal drainage, is entirely ephemeral. Some persistent pools do exist in creek channels, but flow in the drainages generally ceases after spring or early summer. Baseline aquatic studies for Antelope Mine covered Antelope Creek and lower Horse Creek. No fish were found on Horse Creek, and only three common species were found at the upper sampling station on Antelope Creek, in the vicinity of the lease. These were the sand shiner (*Notropis stramineus*), fathead minnow (*Pimephales promelas*), and plains kilifish (*Fundulus zebrinus*); species tolerant of intermittency or adapted to shallow, sandy streams.

3.10.8 Species of Concern

Species of concern for the Horse Creek LBA include federally-listed T&E species, candidates for federal listing and MBHFI.

3.10.8.1 T&E Species

A list of T&E and candidate wildlife species potentially occurring in the lease area is provided in Table 3-7. Observation records for the LBA vicinity were collected from the WYNDD (The Nature Conservancy 1998), WGFD (1997), USFS records, mine permit applications, and annual wildlife monitoring reports for coal mines near the LBA tract. (T&E surveys specific to the proposed lease have not yet been conducted, but during the wildlife survey undertaken for the LBA tract no T&E species were observed).

Federally-listed animal species potentially occurring on the LBA tract are the black-footed ferret (endangered), bald eagle (threatened), and peregrine falcon (endangered) (USFWS written communication 8/12/98). Two candidate animal species, the mountain plover and swift fox, could occur on the LBA tract. Preble's meadow jumping mouse, now listed as threatened, was not included as potentially present in the area by USFWS (written communication 8/12/98). The Horse Creek LBA Tract is not within the recognized historical or present distribution of this subspecies.

The black-footed ferret was once distributed throughout the high

Table 3-7. Threatened, Endangered, and Candidate Wildlife Species and Their Potential Occurrence within the Horse Creek Lease Area.

Common Name	**Scientific Name**	**Status**	**Expected Occurrence**
Mammals			
Black-footed ferret	*Mustela nigripes*	Endangered	Potential resident in prairie dog colonies
Swift fox	*Vulpes velox*	Candidate	Potential resident
Birds			
Peregrine falcon	*Falco peregrinus*	Endangered	Migrant
Bald eagle	*Haliaeetus leucocephalus*	Threatened	Common winter resident
Mountain plover	*Charadrius montanus*	Candidate	Summer resident, breeder

plains of the Rocky Mountains and the western Great Plains. Prairie dogs are the main food source of black-footed ferrets, and few ferrets have historically been collected away from prairie dog colonies. In July 1998, the National Wildlife Federation petitioned the USFWS to have the black-tailed prairie dog declared a threatened species. USFWS must now make a decision on that request.

No prairie dog colonies exist on or adjacent to the LBA tract, but some occur within a few miles (see Figure 3-8). Some of these colonies have been surveyed for ferrets in conjunction with mine permit applications or prior to mining disturbance. The USFS conducted surveys on all prairie dog colonies on the TBNG throughout the 1980s. The only evidence of black-footed ferret presence resulting from any survey in the region was a single skull collected in 1979 in a prairie dog colony roughly three miles east of the LBA tract. That colony is no longer active.

Bald eagles are relatively common winter residents in the PRB. Wintering birds roost communally in wooded canyons or riparian groves. During the day, they disperse widely to forage, often feeding on carrion. The only suitable roosting habitat on or near the LBA tract would be cottonwood stands along Antelope Creek. However, no bald eagle roosts have been documented along the creek in the vicinity of the proposed LBA tract. The nearest communal bald eagle roosts are over six miles to the east and southwest of the LBA tract. No unique or concentrated sources of carrion or prey occur on the tract, so foraging bald eagles would not be attracted to the area in great numbers. A few isolated bald eagle nesting attempts have been recorded in the region, but none have been near the LBA tract.

Peregrine falcons feed almost exclusively on birds, especially waterfowl. Peregrines nest on high cliffs, generally near a substantial water source. No suitable nesting habitat for peregrine falcons exists on or near the LBA tract, and no unique source of prey is available to attract them to the area. Peregrine falcons have been observed in the vicinity of Antelope Mine (and, thus, the LBA tract) twice during the 16 years from 1982 through 1997.

The mountain plover is a candidate species summering in the high, dry short-grass plains east of the Rocky Mountains. In some areas this species seems to preferentially occupy prairie dog colonies. Most observations on TBNG lands have been associated with prairie dog colonies. However, a study of mountain plovers on and near Antelope Mine (Parrish 1988) showed birds occupying areas both on and off colonies. Parrish noted that mountain plover nests were found in areas of short (<4") vegetation on slopes of less than three percent; and concluded that any short-grass, very short shrub, or cushion plant communities could be considered potential nesting habitat. Under those criteria, much of the LBA tract is too steep to be considered ideal mountain plover habitat.

Mountain plover use areas in the vicinity of Antelope Mine were identified during a 2-year contract study by the USFWS Cooperative Wildlife/Fisheries Research Unit in Laramie, Wyoming (Parrish 1988). Small portions (totaling less than ten acres) of two identified use areas overlap the LBA tract (Figure 3-8). Subsequent to the USFWS study, use areas on and near Antelope Mine have been surveyed annually during wildlife monitoring. This includes the two use areas, #11 and #12, that overlap the LBA tract. Plovers were last observed on those use areas in 1989 and 1984, respectively. However, they have been regularly observed in the vicinity of Antelope Mine and have nested within two miles of the LBA tract.

ACC has developed a habitat recovery and replacement plan to mitigate impacts of mining on mountain plovers. That plan, which is incorporated into ACC's WDEQ/LQD mining permit application, has been approved by the USFWS. Further site-specific surveys of the LBA tract will be conducted as part of the WDEQ mine permitting process if a lease is issued for this tract.

The swift fox, also a candidate species, is found east of the Rocky Mountains from the northern Great Plains south to Texas. In Wyoming, this species inhabits the eastern Great Plains grasslands, occasionally utilizing agricultural lands and irrigated meadows. Prey includes small mammals, insects, and birds. No recent sightings of swift fox have been reported on or near the LBA tract; however, much of the PRB, including the LBA tract, is potential swift fox habitat. In 1995 and 1996, the USFS conducted limited surveys for swift fox on the TBNG using track plate routes. Track plates are glass plates placed on the ground that record an image of an animal's footprint. One survey route was located roughly ten miles north of the LBA tract. No evidence of swift fox presence was detected during USFS surveys.

3.10.8.2 Migratory Birds of High Federal Interest

The USFWS has expressed concern for 17 avian species or subspecies that may occur in the PRB coal region. These species have been designated MBHFI. Table 3-8 lists those species and their expected occurrence on or near the LBA tract. Since 1982, 13 of the 17 MBHFI species have been recorded at least once on or within one-half mile of the Antelope Mine.

The most common MBHFI recorded in the analysis area are raptors and mountain plovers. As noted above, ferruginous hawks, golden eagles, and burrowing owls are known to nest on or within two miles of the LBA tract. Bald eagles are regularly observed in the vicinity of the LBA tract in winter, but no bald eagle roosts or nests occur nearby. Other raptor MBHFI species documented in the analysis area include the prairie falcon *(Falco mexicanus)*, merlin (*Falco columbarius*), and peregrine falcon (*Falco peregrinus*). Observations of these species are uncommon to rare. Observed individuals were likely migrating through the area, as no suitable nesting habitat exists for these species on the LBA tract. As discussed above, mountain plovers were last observed within the proposed lease area in 1989.

None of the other MBHFI are expected to occur or breed on the LBA tract, due to lack of appropriate habitat.

3.11 Ownership and Use of Land

The surface on the Horse Creek LBA Tract and the Alternative 2 configuration is owned by ACC, PRCC, Jerry and Barbara Dilts, and Ms. Frances Putnam (see Figure 3-9).

The primary areas of current disturbance within the Horse Creek LBA Tract include roads and the BN & UP railroad. Paved County Road 37 in Converse County, and Antelope Road in Campbell County, runs north-south to the east of the LBA tract; the BN & UP rail line runs north-south through the eastern portion of the LBA tract as applied for and curves to the west through a portion of the area added under Alternative 2. No oil wells are present within the Horse Creek LBA Tract itself; there is, however, one producing well located northwest of the tract (see Figure 3-9). This well produces from the Late Cretaceous Turner Sandstones. Most of the oil and gas rights within the LBA tract are federally owned, and most of the federal oil and gas rights are leased. A pipeline crosses the LBA tract (see Section 3.17 for further discussion of transportation facilities).

Table 3-8. MBHFI Status in Northeastern Wyoming and Their Expected Occurrence on the Horse Creek Lease Area.

Species	**Seasonal Status/Breeding Records in the Horse Creek Lease Vicinity**[1]	**Expected Occurrence on LBA Tract**	**Record of Sighting Near LBA Tract**[2]
White pelican	Summer/Nonbreeder	Rare/migrant	Yes
Double-crested cormorant	Summer/Nonbreeder	Uncommon/migrant	Yes
Canvasback	Summer/Nonbreeder	Uncommon	Yes
Ferruginous hawk	Summer/Breeder	Common	Yes
Golden eagle	Resident/Breeder	Common	Yes
Bald eagle	Resident/Breeder[3]	Common in winter	Yes
Osprey	Summer/Nonbreeder	Rare	No
Prairie falcon	Resident/Breeder	Common	Yes
American peregrine falcon	Migrant/Nonbreeder	Rare	Yes
Richardson's merlin	Resident/Breeder	Uncommon	Yes
Whooping crane	Never Recorded	Very Rare	No
Sandhill crane	Migrant/Nonbreeder	Rare	No
Mountain plover	Summer/Breeder	Common	Yes
Long-billed curlew	Summer/Nonbreeder	Rare	Yes
Burrowing owl	Summer/Breeder	Uncommon	Yes
Lewis' woodpecker	Summer/Nonbreeder	Rare	Yes
Dickcissel	Summer/Nonbreeder	Rare	No

[1] Compiled from WGFD (1997), for a 1° latitude by 1° longitude block that encompasses southern Campbell and northern Converse counties. Augmented by mine monitoring data from Antelope and adjacent mines.

[2] Records from Antelope Mine annual wildlife monitoring reports. Includes Antelope Mine permit area plus a one-half mile perimeter.

[3] Primarily a winter visitor. Resident/Breeder designation based on rare and isolated breeding attempts.

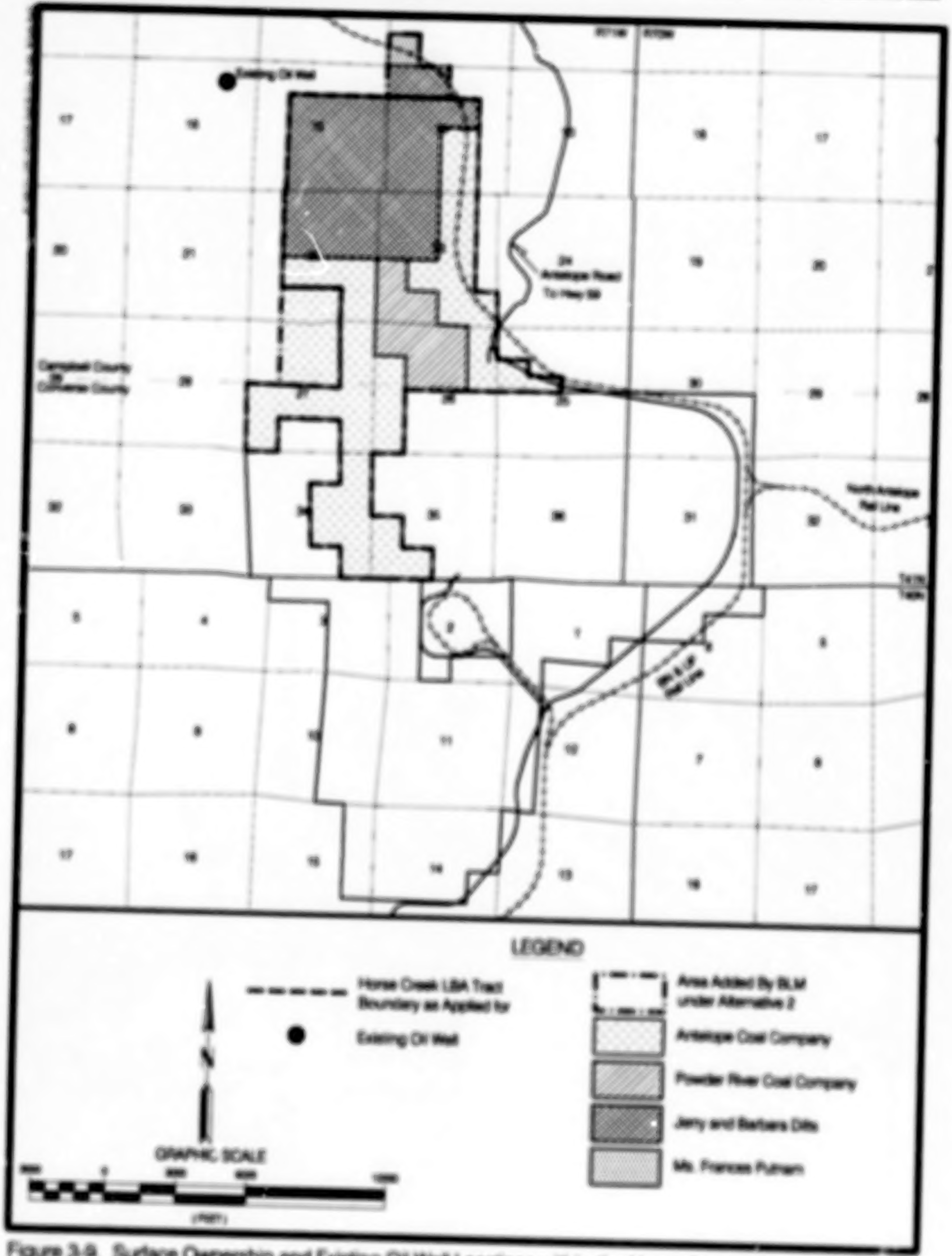

Figure 3-9. Surface Ownership and Existing Oil Well Locations within the Horse Creek LBA Tract

Coal mining is a dominant land use in the area surrounding the LBA tracts. The existing Antelope Mine is within a group of six operating surface coal mines located in southern Campbell and northern Converse counties (see Figure 3-1). Coal production at these six mines increased by 97 percent between 1990 and 1997 (from about 70 million tons in 1990 to over 138 million tons in 1997). Since 1992, seven maintenance coal leases have been issued within this group and applications have been submitted and are being processed for two more maintenance tracts in this same group, including the LBA being evaluated in this EIS (see Tables 1-1 and 1-2). BLM also received an application for a coal lease for a potential new mine start (New Keeline tract, see Table 1-2) located north of the Jacobs Ranch Mine (see Figure 1-1). This application was reviewed by the PRRCT at their April 23, 1997 public meeting. The PRRCT recommended that the BLM defer action on this application at this time. The application was subsequently rejected without prejudice by the BLM Wyoming State Director in a June 13, 1997 decision.

Converse and Campbell counties have no county-wide land use plan, and the LBA tract has no designated zoning classification. The *City of Gillette/Campbell County Comprehensive Planning Program* (City of Gillette 1978) provides general land use goals and policies for state and federal coal leases in the county. *The Converse County Land Use Plan* (Converse County 1978) does not specifically address coal leasing.

Big game hunting is the principal recreational use in the analysis area. Land ownership within the PRB is largely private (approximately 80 percent), with some private landowners permitting sportsmen to cross and/or hunt on their land. Others charge an access fee, and some do not allow any access. There has been a trend over the past two decades towards a substantial reduction in lands open and reasonably available for hunting. Access fees continue to rise and many resident hunters feel these access fees are unreasonable. This trend has created management problems for the WGFD in their attempt to distribute and control harvest at optimal levels, as well as to sportsmen who desire access to these animals (WGFD 1996). Due to safety concerns, public lands contained within an active mining area are often closed to the public, further limiting recreational use. In the PRB, the publicly owned TBNG, BLM lands, and state school sections (normally Sections 16 and 36) are generally open to hunting if legal access is available.

All of the lands within the LBA tract are currently privately owned and recreational use is allowed only with landowner permission. Sport hunting in varying degrees is conducted on the LBA tract. Pronghorn, mule deer, and white-tailed deer occur on and adjacent to the LBA tract. Sage grouse, mourning dove, waterfowl, cottontail rabbit, and coyote may also be harvested in the vicinity, and some trapping of red fox may occur.

Specific details regarding big game herd management objectives in the project area are contained in the *Casper and Sheridan Region Annual Big Game Herd Unit Reports* (WGFD 1998).

The LBA tract is within pronghorn Hunt Area 27, part of the Lance Creek Herd Unit which also includes Hunt Areas 6, 8, 9, and 29. The severe winter of 1992-93 and summer drought of 1994 resulted in an estimated 39 percent mortality in this herd, and WGFD thus reduced the number of licenses in 1993 from 3,000 to 2,000. They issued 2,800 licenses annually in 1995 and 1996 and issued 3,200 licenses in 1997. WGFD anticipates the pronghorn population will continue to grow to the post-hunt population objective of 25,000 to 30,000 (assuming normal reproduction and good weather conditions). In 1998, hunters harvested about 2,425 animals with a 97 percent success rate and spent about 3.0 hunting days per animal harvested, generating 7,674 recreation days during the 1998 season. In 1998, 2,900 licenses were issued.

The Horse Creek LBA Tract is classified as yearlong habitat for pronghorn. The Lance Creek Herd Unit does not contain any designated crucial habitat. Pronghorn are widely scattered throughout the herd unit.

The Horse Creek LBA Tract is in mule deer Hunt Areas 10 and 167. Hunt Area 10 is in the Thunder Basin Herd Unit and Hunt area 167 is in the Lance Creek Herd Unit. The WGFD estimated the 1998 post-season mule deer population in the Thunder Basin Herd at approximately 15,000, somewhat over the objective of 13,000. The estimated population in the Lance Creek Herd was roughly at the objective of 18,000. The WGFD has managed this herd for an annual harvest of approximately 1,800 deer. The hunting season is designed to allow the population to grow; however, much of the preferred habitat in this herd unit occurs in drainage bottoms on private land, where grazing-related conflicts can occur with landowners. The population objective may be increased in the future if landowner and public sentiment allow. In 1998, 1,421 mule deer were harvested by 2,630 hunters resulting in a 54.0 percent success rate. About 6.4 hunter days per animal were spent, for a total of 9,154 recreation days. In 1998, 1,663 mule deer were harvested from the Lance Creek Herd by 2,586 hunters resulting in a 64 percent success rate. Hunters averaged 4.9 days per animal harvested for a total of 8,126 recreation days. Most of the Horse Creek LBA Tract is classified as yearlong deer range; the extreme southeast corner of the LBA tract is considered winter/yearlong deer range.

The Rochelle Hills Elk Herd is located about six miles to the northeast of the LBA tract. Although Elk Hunt Area 113 extends into the tract, very limited use of these lands by elk occurs; elk favor the ponderosa pine/juniper woodlands, savanna, and steeper terrain habitat in the Rochelle Hills, east of the LBA tract. This small herd (about 200 elk) is hunted every two to three years. Owing to their habituation to humans, these elk provide a significant amount of non-consumptive recreational use. Landowners appear tolerant of the elk, and the WGFD will likely increase the population objective in the future. These elk are dispersing from the designated herd unit boundary, possibly due to density-dependent population factors related to limited habitat.

White-tailed deer have been seen occasionally in the vicinity of the LBA tract, but they are not common. White-tailed deer are managed as part of the Thunder Basin Herd Unit, an area which extends from the Montana border through Gillette, Moorcroft, Newcastle, and south to Lusk and Douglas. White-tailed deer are not managed separately in this herd unit, but generally are included in the management of the corresponding mule deer herd units. White-tailed deer use is concentrated in riparian areas, which are predominantly privately owned. Doe/fawn licenses are therefore allocated to reduce grazing conflicts on private land in specific areas.

Public fishing opportunities are extremely limited in the PRB. Only one fishery exists in the general analysis area: Little Thunder Creek supports channel catfish and a variety of nongame fish. No fisheries exist on the LBA tract.

3.12 Cultural Resources

Cultural resources, which are protected under the National Historic Preservation Act of 1966, are the nonrenewable remains of past human activity. The PRB appears to have been inhabited by aboriginal hunting and gathering people for more than 11,000 years. Throughout the prehistoric past, the area was used by highly mobile hunters and gatherers who exploited a wide variety of resources.

The general chronology for aboriginal occupation (dated as years before present [B.P.]) is:

- the Paleoindian period (11,000-7,500 years B.P.),
- the Archaic period (7,500-1,800 years B.P.),
- the Prehistoric period (1,800-400 years B.P.),
- the Protohistoric period (400-200 years B.P.), and
- the Historic period (200-120 years B.P.).

The Paleoindian period includes a series of cultural complexes identified by distinctive large projectile points (spear points) often associated with the remains of large, now-extinct mammals (mammoth, bison, camel, etc.). The Archaic period is characterized by a range of smaller side-notched, stemmed, or corner-notched projectile points and by more generalized subsistence pursuits including the gathering of plant resources. This lifeway continued to the late Prehistoric period, which is marked by a technological change from dart projectiles to the bow and arrow and by the appearance of ceramics. During the Archaic and late Prehistoric periods, the PRB was occupied by small bands of hunters and gatherers whose movements were determined to a large degree by seasonal and environmental changes which influenced the occurrence of subsistence resources (BLM 1979).

Protohistoric and early Historic sites are found in the PRB, including rare historic trade goods, sites and routes associated with early trappers and military expeditions, and early ranching attempts which date to the 1880's. A few small coal mining sites also exist.

Historic sites within the analysis area have been recorded as debris scatters representing sheepherder camps and related activities. No historic trails are known or have been recorded on the LBA tracts; however, the Bozeman Trail crosses the southwestern portion of the PRB.

A Class III cultural resources survey is a professionally conducted, intensive inventory of a target area, designed to locate all cultural properties which have surface and exposed profile indications. Cultural properties are recorded and sufficient information collected on them to allow evaluation for possible inclusion in the NRHP. That determination is made by the managing federal agency in consultation with SHPO.

Once a Class III survey is completed, site-specific testing or limited excavation is utilized, if necessary, to gather additional data which will: 1) determine the final evaluation status of a site and/or 2) form the basis of additional work that will be conducted during implementation of a treatment plan if the site is eligible for the NRHP. A treatment plan is then developed for those sites that are eligible for the NRHP and are within the area of potential effect. Treatment plans are implemented prior to mining and can include such mitigative measures as avoidance (if possible), large scale excavation, complete recording, Historic American Building Survey/Historic American Engineering Record documentation, archival research, and other acceptable scientific practices.

Numerous Class III cultural resource inventories have been conducted by ACC for lease expansion areas adjacent to the Antelope Mine. These inventories were conducted in 1981, 1996, 1997 and 1998. The inventories cover the entire LBA area and a buffer zone that would include all disturbance assuming the area is mined as a maintenance tract for the existing adjacent mine.

Thirty-six sites and at least ten isolated finds have been identified by surveys conducted in the Horse Creek LBA Tract and buffer zone in both Campbell and Converse Counties. Seventeen of these sites are in Converse County, while nineteen sites are in Campbell County. Additional sites are present immediately outside the LBA tract. All portions of the Proposed Action area and all but forty acres of the Alternative 2 option have been subject to Class III inventory and SHPO consultation on site evaluations.

In Converse County, the following sites were recommended eligible: 48CO441; 494; 495; and 516. Sites 48CO485; 487; and 496 were originally classified as of undetermined eligibility. These seven sites were subjected to additional data recovery actions (testing, data recovery, etc.) in 1982, resulting in determinations of 'no adverse effect' (SHPO correspondence 10 August 1988, Deputy SHPO Thomas E. Marceau to OSM Roger Peterson). All remaining sites have been recommended not eligible: 48CO458; 459; 460; 461; 463; 466; 489; 490; 2221 and 2222.

In Campbell County, the following sites have been recommended eligible: 48CA3030 and 3067. No sites are of undetermined eligibility, and seventeen sites have been determined not eligible: 48CA660; 1669; 2959; 3029; 3031; 3032; 3033; 3034; 3065; 3066; 3068; 3069; 3094; 3095; 3096; 3098; and 3099. Sites immediately outside the LBA boundary include 48CA884; 885; 1547; 2892; 3100 and 3101; of these, 48CA2892 is recommended for protective stipulations or mitigation.

Table 3-9 summarizes the distribution of cultural sites by type. Sites 48CA3095 and 3096 contain both prehistoric and historic cultural elements.

Data recovery plans are required for those sites recommended eligible to the National Register following testing and consultation with the SHPO. Until full consultation has occurred, identifying the sites for mitigation or release, sites recommended eligible or of undetermined eligibility must be protected.

3.13 Native American Consultation

Native American heritage sites can be classified as prehistoric or historic. Some may be presently in use as offering sites, fasting or vision quest sites and selected rock art sites. Other sites of cultural interest and importance may include rock art sites, tepee rings, and various rock features, fortifications or battle sites, burials, as well as locations which are sacred or part of the oral history and heritage that have no man-made features. No Native American heritage sites have been identified to date.

There are presently no documented Native American sacred sites in the general analysis area. However, the position of the area between mountains considered sacred by various Native American cultures (the Big Horn Mountains to the west, the Black Hills to the east, and Devils Tower to the north) creates the possibility of existing locations which may have special religious or heritage significance to Native American groups.

Native American tribes consulted at a general level for the 1995-1996 draft Buffalo Resource Area RMP. The Crow, Northern Cheyenne, Eastern Shoshone, Northern Arapaho, and

Table 3-9. Sites and Isolated Finds in the Class III Cultural Resource Inventory of the Horse Creek LBA Tract and Buffer Zone.

Prehistoric sites:	
Campsites:	48CA660; 884; 2892; 3030; 3066; 3067; 3068; 3069; 3098; 48CO441; 459; 466; 487; 516; 2222;
Lithic Sites:	48CA885; 1669; 2959; 3029; 3031; 3032; 3033; 3034; 3065; 3094; 3095; 3096; 3100 48CO460; 461; 463; 485; 489; 490;494; 495; 496; 2221
Quarries:	48CO458
Cairns:	48CA1547; 3064
Isolated Finds:	9 lithic items
Historic sites:	
Sheepherder's camp:	48CA3099
Trash scatter:	48CA3096; 3101
Cairn:	48CA3095
Isolated Finds:	1 bottle
Multicomponent Sites:	48CA3095; 3096

Oglala Sioux tribal governments and representatives received scoping notices requesting information on any concerns they have relating to this lease application. These tribal governments and representatives were sent certified letters providing them with information about the location of the LBA tract and known sites on this tract. Their help was requested in identifying potentially significant religious or cultural sites on the LBA tract to support a leasing decision on the tract.

3.14 Paleontological Resources

The formations exposed on the surface of the PRB are the sedimentary Eocene Wasatch and Paleocene Fort Union formations, which are both known to contain fossil remains. Some paleontological surveys have been conducted in the PRB. Vertebrate fossils that have been described from the Wasatch Formation in the PRB include fish, turtle, champosaur, crocodile, alligator, and mammal specimens. The Fort Union also contains fossils of plants, reptiles, fish, amphibians, and mammals. No significant

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paleontological localities have been recorded on federal lands near the LBA tract.

Four paleontological surveys have been conducted in the vicinity of the Horse Creek LBA Tract, and no vertebrate fossils have been identified in the Wasatch Formation. The surveys concluded that no scientifically significant fossils had been found in the Fort Union Formation and that it was unlikely that this situation would be different in the Horse Creek LBA Tract based on known conditions of deposition and fossil preservation. As a result, BLM has concluded that no further literature, records or field surveys need to be completed prior to surface disturbance because the likelihood of impacting significant fossils is small.

3.15 Visual Resources

Visual sensitivity levels are determined by people's concern for what they see and the frequency of travel through an area. Landscapes within the general analysis area include rolling sagebrush and short-grass prairie, which are common throughout the PRB. Existing surface mines form a nearly continuous band on the east side of Highway 59 from Gillette south about 50 mi. Other man-made intrusions include ranching activities (fences, homesteads, livestock), oil and gas development (pumpjacks, pipeline ROW's), transportation facilities (roads and railroads) and electric power transmission lines. The natural scenic quality in the immediate lease area is fairly low because of the industrial nature of the adjacent existing mining operations.

The Antelope Mine facilities and some mining activity are currently visible from County Road 37. This would also be true for the LBA tract.

For management purposes, BLM evaluated the visual resources on lands under its jurisdiction in the Buffalo and Platte River Resource Area RMPs. The inventoried lands were classified into VRM classes. These classifications range from I to V as follows:

Class I - Natural ecologic changes and very limited management activity is allowed. Any contrast (activity) within this class must not attract attention.

Class II - Changes in any of the basic elements (form, line, color, texture) caused by an activity should not be evident in the landscape.

Class III - Contrasts to the basic elements caused by an activity are evident but should remain subordinate to the existing landscape.

Class IV - Activity attracts attention and is a dominant feature of the landscape in terms of scale.

Class V - This classification is applied to areas where the natural character of the landscape has been disturbed up to a point where rehabilitation is needed to bring it up to the level of one of the other four classifications.

The lands in the Horse Creek LBA area are generally classified as VRM Class IV. The existing mining activity is visible from most sites on the LBA tract.

3.16 Noise

Existing noise sources in the area include adjacent coal mining activities, traffic on State Highway 59, rail traffic, and wind. Studies of background noise levels at adjacent mines indicate that ambient sound levels generally are low, owing to the isolated nature of the area. Current noise levels in the Horse Creek LBA Tract are estimated to be 40-60 dBA, with the noise level increasing with increasing proximity to active mining at the Antelope Mine. Mining activities are characterized by noise levels of 85-95 dBA at 50 ft from actual mining operations and activities (BLM 1992b). Figure 3-10 presents noise levels associated with some commonly heard sounds.

3.17 Transportation Facilities

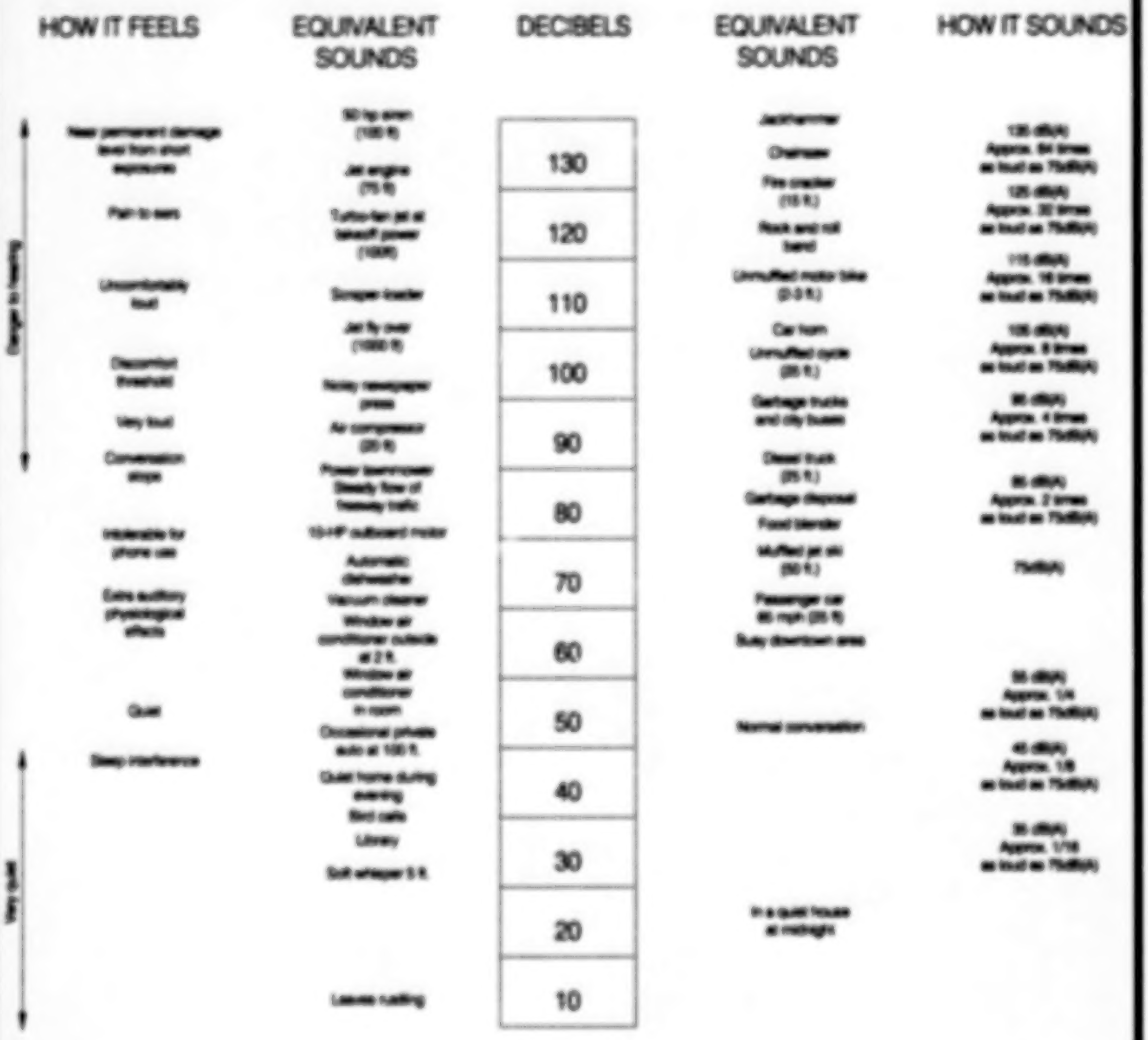
Transportation resources in the vicinity of the Horse Creek LBA Tract include County Road 37 and Antelope Road; State Highway 59; the Gillette-Douglas rail spur used jointly by the Burlington Northern-Santa Fe and Union Pacific Railroads; pipelines; and local roads and accesses (Figure 3-11).

Since the Horse Creek LBA Tract as applied for would be an extension of the existing Antelope Mine operations, the transportation facilities and infrastructure would be the same as those identified in the WDEQ/LQD Mine Permit 525 for Term T6 approved on October 29, 1998, the BLM Resource Recovery and Protection Plan approved on October 28, 1997, and the BLM logical mining unit approved on January 1, 1987.

3.18 Socioeconomics

The social and economic study area for the proposed project involves primarily Converse County and the city of Douglas; however it also includes Campbell County and the cities of Gillette and Wright. The residency breakdown of Antelope Mine employees is: Douglas (46 percent), Gillette (31 percent), Wright (7 percent) and other Wyoming communities (16 percent) (ACC 1998). The communities of Douglas and Gillette would most likely attract the majority of new residents due to their current population levels and the availability of services and shopping amenities.

A comprehensive socioeconomic profile of the BLM Buffalo Resource Area (which includes all of Campbell County) was prepared for the BLM under contract with the Department of Agricultural Economics, College of Agriculture, through the University of Wyoming's Cooperative Extension Service (University of Wyoming 1994). The portion of the following discussion that deals with Campbell County is derived from this report. Converse County socioeconomic data



Adapted From ABC's of Our Noise Codes published by Citizens Against Noise, Honolulu, Hawaii

Figure 3-10. Relationship between A-scale Decibel Readings and Sounds of Daily Life.

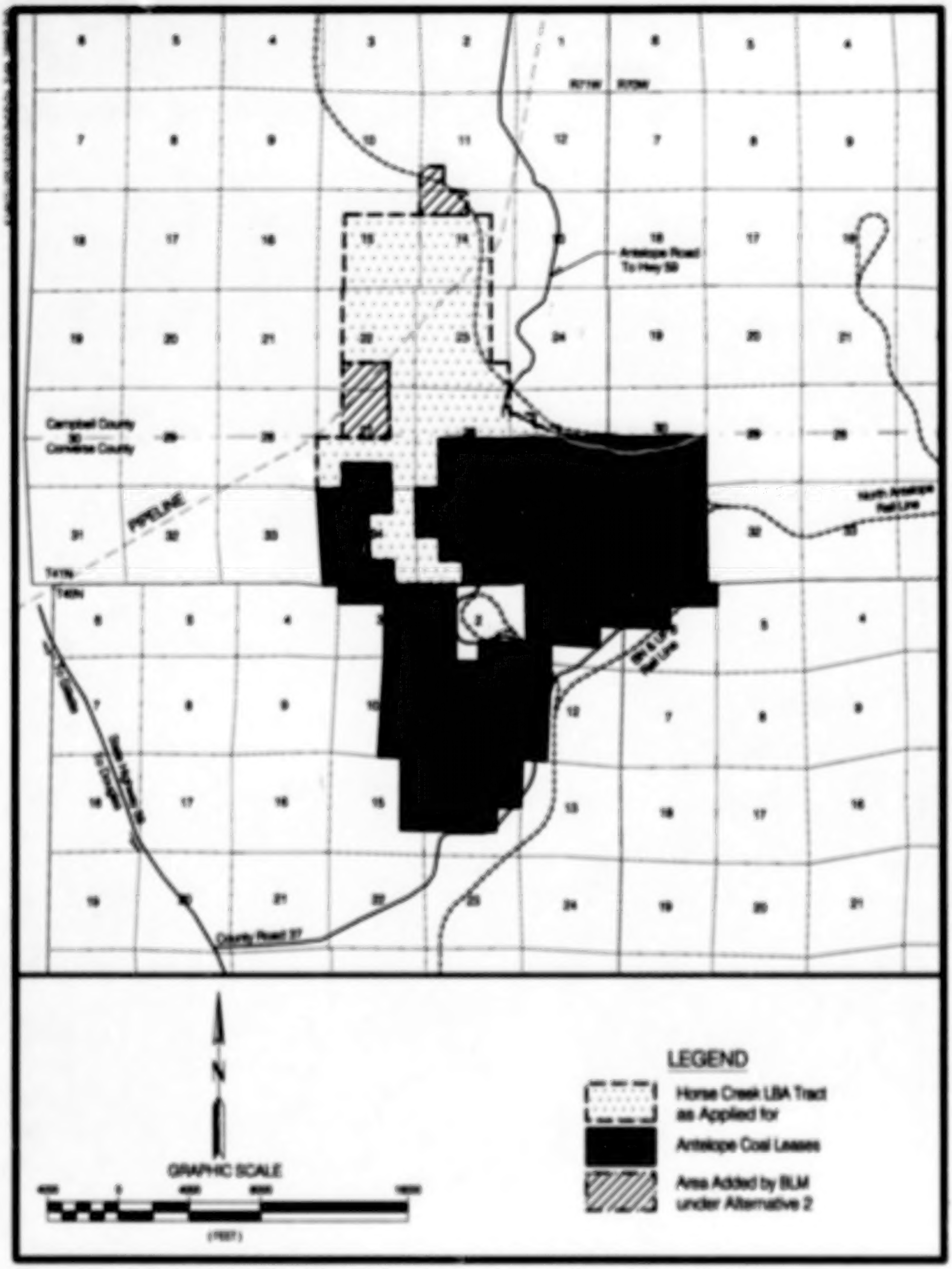


Figure 3-11. Transportation Facilities within and adjacent to the Horse Creek LBA Tract.

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and additional Campbell County data were obtained from the Wyoming Department of Commerce, Wyoming Division of Economic Analysis, Wyoming Department of Employment, Wyoming Economic Development Office, and personal communications with local community development staff.

3.18.1 Population

Converse County's population in 1990 was listed as 11,128, with 5,076 of the county's residents residing in Douglas. According to 1990 census data, Campbell County had a population of 29,370, with Gillette accounting for 17,635 of the county's residents and Wright with 1,200. The 1995 populations of Campbell and Converse Counties were 31,668 and 11,965, respectively, indicating increases from 1990 to 1995 of 7.8 percent (Campbell) and 7.5 percent (Converse) (U.S. Bureau of Census 1996).

3.18.2 Local Economy

Coal production, as reported by the Wyoming State Inspector of Mines, showed the State's coal producers set a new yearly production record of 315.0 million tons in 1998. This was an increase of 11.9 percent over the 281.5 million tons produced in 1997. Campbell County coal production (16 mines) increased by 11.3 percent (246.3 million tons to 274.1 million tons) from 1997 to 1998, while production in Converse County (2 mines, including Antelope) increased by 31.5 percent (17.8 million tons to 23.4 million tons). The combined 1998 production from the surface coal mines in these two counties was 94.4 percent of the total production in the State (Wyoming Geological Survey, Geonotes 61 March 1999).

In 1997, 24 percent of the total employment and 28 percent of the total personal income in Campbell County were directly attributable to mining. In Converse County for that year, 11 percent of the employment and 16 percent of the total personal income were directly attributed to mining (Wyoming Department of Employment, 1999).

Approximate tax revenues from coal production in Campbell and Converse counties are presented in Table 3-10. Sales and use taxes are distributed to cities and towns within each county and to the county's general fund. Severance taxes are collected by the state for the removal or extraction of resources such as oil, natural gas, coal, and trona. The State of Wyoming retains approximately 83 percent of the severance tax, and the remainder is returned to the cities, towns, and counties. Ad valorem taxes, which include property taxes, are collected by the county and disbursed to schools, cities, towns, the state foundation, and various other subdivisions within the county. Mineral royalties are collected on the amount of production and the value of that production. The current royalty rate for federal coal leases is 12.5 percent, with half of this revenue returned to the state. Additional sources of revenue include lease bonus bids (also split with the state) and annual rentals that are paid to

Table 3-10. Estimated 1999 Fiscal Revenues from 1998 Coal Production in Campbell County and Converse County

Year	Sales and Use Collections[1]	Severance Tax Collections[1]	Ad Valorem Tax Collections[1]	Royalty Collections[2]	Total Collections
Campbell County	$ 12.9 million	$69.0 million	$53.0 million	$162.1 million	$297.0 million
Converse County	$ 1.4 million	$ 5.0 million	$ 3.2 million	$ 13.8 million	$23.4 million

[1] Estimated tax receipts are based on most recent published records of Wyoming Department of Revenue.

[2] Royalties are based on 12 ½ percent of sales price on 1998 production, with sales price being the average for northeastern Wyoming (Wyoming Geo-Notes No. 61 March 1999).

the federal government. The total fiscal benefit to the State of Wyoming from coal mining in the PRB has recently been estimated at $1.10/ton of coal mined (University of Wyoming 1994).

Nationally, the minerals industry is 1.3 percent of the GNP. In Wyoming, the minerals industry (including oil and gas) is 31 percent of the GSP, which makes it the largest sector of the Wyoming economy. Coal mining alone accounts for 9 percent of the Wyoming GSP (Wyoming Dept. of Administration and Information March 1999).

3.18.3 Employment

Coal mining has changed a great deal since the 1970's, and new technologies have been a major contributor to these changes. The local coal mining labor force grew during the 1970's, but declined during the 1980's. Since 1973, overall production has risen while employee numbers have decreased. This employment decline followed large industry capital investments in facilities and production equipment, the majority of which was aimed at increasing productivity. Direct employment in the two counties' coal mining industry has remained relatively constant over the last few years at approximately 3,100 full-time employees.

As of January 1999, the total labor force in Campbell County stood at 19,495 with an unemployment rate of 6.7 percent (compared to 5.7 percent in January 1998 (Wyoming Department of Employment, Research and Planning 1999). About 2,808 people were directly employed in coal mining, representing about 15 percent of the employed labor force (Campbell County 1998).

Total employment in Campbell County peaked in 1985 at 21,668, the same year that mining employment (which in this case includes oil and gas workers) peaked at 6,312. Total employment has been growing since a low of 18,103 in 1988. Mining employment reached a recent low in 1992.

As of January 1999, the total Converse County labor force was 6,390, with an unemployment rate of 6.2 percent, compared to 6.0 percent a year earlier. About 356 people, or five percent of the labor force, were directly employed by area coal mines (WCIC 1998). Total employment in Converse County declined from 7,643 in 1981 to a low of 5,988 in 1990, and has been increasing since that time. Mining employment in Converse County declined from 2,129 in 1981 to a low in 1991 of 723, and has been slowly increasing since that time.

3.18.4 Housing

In 1996, Gillette contained 7,775 housing units, and Wright contained 497 housing units, according to the Campbell County Economic Development Corporation (1997 Community Profile). According to the 1990 census, Campbell County contained 11,538 housing units, 7,078 of which were in Gillette. In 1996, the average cost of a new 3-bedroom home in Gillette was $109,000; the average cost of an existing 3-bedroom home was $88,500. In Wright, the average 1996 prices of new and existing 3-bedroom homes were $88,000 and $45,000, respectively. Residential building permits in Campbell County rose from 15 in 1987 to 82 in 1992 to 100 in 1998. Vacant housing in Gillette is estimated at approximately 549 units.

In Converse County, residential building permits varied between zero and two per year from 1987 to 1992, rose to 27 in 1997 and fell to 12 in 1998. Douglas contained 2,267 housing units in 1992, with an estimated 59 vacant units, including 24 single-family homes, 30 mobile homes, and five multi-family units.

3.18.5 Local Government Facilities and Services

Gillette maintained a steady population growth from 1987, when it totaled 17,054, until 1996, when it was estimated at 21,585. According to 1997 article in the Gillette News Record, however, population dropped slightly in 1997, to about 21,410. Owing to the substantial revenues generated by coal production, local government facilities and services have kept pace with growth and are adequate for the current population. The primary exception is a lack of space in the Gillette high school; however, approval of a recent bond issue will facilitate construction of a new school.

The 1996 population of Douglas (5,479) is lower than its peak of 7,800 in 1982, and local government facilities and services are generally adequate for the current population. The town also has limited building space (platted lots) available for future growth. Some indoor recreational facilities may also be near or at capacity.

Wright was established in 1976 by ARCO and is the nearest community to the southern group of PRB mines. Wright's population peaked in 1985 at approximately 1,800 and decreased to 1,285 by 1994. The 1996 population of Wright was 1,400. Over the past few years, many of the coal mines have transitioned from working 10-hour shifts to 12-hour shifts. Many miners have thus relocated to Wright to cut down on commuting time, which is why the population has recently increased to approximately 1,400. Several coal service companies are also cutting back on travel allotments, which is further adding to Wright's current population growth. Wright's infrastructure is more than adequate for the current and planned population, and with the current building going on, it can double in population before services become limiting.

3.18.6 Social Conditions

Despite past boom and bust cycles in the area's economy, a relatively stable social setting now exists in these communities. Most residents have lived in the area for a number of years, social ties are well established, and residents take great pride in their communities. Many of the people place a high priority on maintaining informal lifestyles and small town traditions, and there are some concerns that the area could be adversely affected by more than a modest growth in population. At the same time, there is substantial interest in enhancing the economic opportunities available in the area and a desire to accommodate reasonable levels of growth and development.

According to the most current Economic Forecast Report (Wyoming Dept. of Administration and Information February 1999), Wyoming's economy reached the bottom of an energy bust in 1987 and started to recover. That recovery began to slow in 1996. The forecast is for slow growth through 2006. Wyoming population is projected to increase at 0.5 percent per year and non-agricultural employment at 1.1 percent. Coal mining is projected to 140 jobs from 1998 to 2000, then remain flat through 2008.

3.18.7 Environmental Justice

Environmental Justice issues are concerned with actions that unequally impact a given segment of society either as a result of physical location, perception, design, noise, etc. On February 11, 1994, Executive Order 12898, "Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations" was published in the *Federal Register* (59 FR 7629). The Executive Order requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations (defined as those living below the poverty level). The Executive Order makes it clear that its provisions apply fully to Native American populations and Native American tribes, specifically to effects on tribal lands, treaty rights, trust responsibilities, and the health and environment of Native American communities.

Communities within Campbell and Converse counties, entities with interests in the area, and individuals with ties to the area all may have concerns about the presence of a coal mine within the general analysis area. Communities potentially impacted by the presence or absence of a coal mine have been identified in this section of the EIS. Environmental Justice concerns are usually directly associated with impacts on the natural and physical environment, but these impacts are likely to be interrelated with social and economic impacts as well. Native American access to cultural and religious sites may fall under the umbrella of Environmental Justice concerns if the sites are on tribal lands or access to a specific location has been granted by treaty right.

Compliance with Executive Order 12898 concerning Environmental Justice was accomplished through opportunities for the public to receive information on this EIS in conjunction with the consultation and coordination described in Section 1.5 of this document. This EIS and contributing socioeconomic analysis provide a consideration of impacts with regard to disproportionately adverse impacts on minority and/or low-income groups, including Native Americans.

3.19 Hazardous and Solid Waste

Potential sources of hazardous or solid waste on the Horse Creek LBA Tract would include spilling, leaking, or dumping of hazardous substances, petroleum products, and/or solid waste associated with mineral, coal, oil and/or gas exploration and development or agricultural or livestock activities. No such hazardous or solid wastes are known to be present on the LBA tract. Wastes produced by current mining activities at the Antelope Mine are handled according to the procedures described in Chapter 2.

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter discloses the potential environmental consequences that may result from implementing the Proposed Action, Alternative 1 (the No-Action Alternative), and Alternative 2. The effect or impact a consequence will have on the quality of the human environment is also discussed. For instance, the consequence of an action may be to greatly increase the number of roads in an area. If the number of roads in an area is increased, opportunities for road-based recreation would be increased but opportunities for primitive recreational activities and solitude would be decreased. Evaluation of the impact would depend on an individual's (or a group's) preferred use of that area.

If the Horse Creek LBA[1] Tract is leased to the applicant as a maintenance tract under one of the action alternatives, the permit area for the adjacent mine would have to be amended to include the new lease area before it could be disturbed. Table 4-1 shows the area to be mined and disturbance area for the existing Antelope Mine (which represents the No-Action Alternative), and how the mine area would change under the Proposed Action and Alternative 2. If the tract is leased, the area that would have to be added to the existing permit area would be the LBA tract plus an adjacent strip of land that would be used for highwall reduction after mining and such mine-related activities as construction of diversions, flood- and sediment-control structures, roads, and stockpiles. Portions of the LBA tract that are adjacent to the existing leases will be disturbed under the current mining plans in order to recover the coal in the existing leases. The environmental consequences of implementing either the Proposed Action or Alternative 2 are very similar because the size of the area that would be disturbed under each alternative is similar.

Surface mining and reclamation have been ongoing in the PRB for over two decades. During this time, effective mining and reclamation technologies have been developed and continue to be refined. Mining and reclamation operations are regulated under SMCRA and Wyoming statutes. WDEQ technically reviews all mine permit application packages to ensure that the mining and reclamation plans comply with all state permitting requirements and that the proposed coal mining operations comply with the performance standards of the DOI-approved Wyoming program. BLM attaches special stipulations to all coal leases (Appendix D), and there are a number of federal and state permit approvals that are required in order to conduct surface mining operations (Appendix A). The regulations are designed to ensure that surface coal mining impacts are mitigated. The impact assessment that follows considers all measures required by federal and state

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[1] Refer to page vii for a list of abbreviations and acronyms used in this document.

Table 4-1. Comparison of Existing and Proposed Antelope Mine Disturbance Area and Mining Operations

	No Action Alternative (Existing Permit Area)	**Proposed Action**	**Alternative 2**
Additional Lease Area (Acres)	---	2,837.9	3,215.0
Total Lease Area (Acres)	6,008.9	8,846.8	9,223.9
Increase in Lease Area	---	47.2%	53.5%
Estimated Total Disturbance Area (Acres)[1]	5,172	8,362	8,753
Increase in Estimated Disturbance Area	---	62%	69%
Estimated Recoverable Coal Remaining as of 1/99[2] (Million Tons)	183.7	429.7	462.4
Increase in Estimated Recoverable Coal as of 1/99 (Percent)	---	134%	152%

Notes: [1] Total Disturbance Area = area to be mined + area disturbed for mine facilities, access roads, haul roads, railroad facilities, stockpiles, etc.

[2] Estimated Recoverable Coal Resources = tons of mineable coal x recovery factor. For the Horse Creek LBA Tract, mineable coal = 264 millions tons (Proposed Action) or 300 million tons (Alternative 2) and ACC's estimated recovery factor = 93 percent, based on historic operations.

Section 4.1 analyzes the direct and indirect impacts associated with leasing and mining the LBA tract under the Proposed Action and Alternative 2. Section 4.2 presents the probable environmental consequences of the No-Action Alternative (Alternative 1, not issuing a lease for the tract). Section 4.3 discusses regulatory compliance, mitigation, and monitoring in terms of what is required by federal and/or state law (and is therefore part of the Proposed Action and alternatives) and any additional mitigation and monitoring that may be required. Section 4.4 summarizes the residual effects of the Proposed Action and Alternative 2. Section 4.5 discusses the cumulative impacts that would occur if these lands were mined when added to other past, present, and reasonably foreseeable future actions. The cumulative impact analysis includes a discussion of five projects that are in progress or proposed in the area of the LBA tract and that would occur independently of leasing the LBA tracts. These projects are: 1) construction of the North Rochelle Mine facilities and rail loop which began in June of 1997; 2) construction and operation of the ENCOAL Plant, which has been proposed within the rail loop at North Rochelle; 3) construction and operation of the Two Elk power plant, which has been proposed east of the Black Thunder Mine; 4) the construction of the proposed DM&E Railroad line, and 5) the ongoing development of CBM sources west of the area of active coal mining. Section 4.6 analyzes the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity. Section 4.7 presents the irreversible and irretrievable commitments of resources that would occur with implementation of the Proposed Action or Alternative 2.

4.1 Direct And Indirect Impacts Of Action Alternatives

Impacts can range from beneficial to adverse, and they can be a primary result of an action (direct) or a secondary result (indirect). They can be permanent, long-term (persisting beyond the end of mine life and reclamation), or short-term (persisting during mining and reclamation and through the time the reclamation bond is released). Impacts also vary in terms of significance. The basis for conclusions regarding significance are the criteria set forth by the Council on Environmental Quality (40 CFR 1508.27) and the professional judgement of the specialists doing the analyses. Impact significance may range from negligible to substantial; impacts can be significant during mining but be reduced to insignificance following completion of reclamation.

4.1.1 Topography and Physiography

Surface coal mining would permanently alter the topography of the LBA tract. Topsoil would be removed from the land and stockpiled or placed directly on recontoured areas. Overburden would be blasted and stockpiled or directly placed into the already mined pit, and coal would be removed. The existing topography on the LBA tract would be substantially changed during mining. A highwall with a vertical height equal to overburden plus coal thickness would exist in the active pits. Horse Creek would be diverted into temporary channels or blocked to prevent flooding of the pits. A direct, permanent impact would be topographic moderation. The restored land surface would contain gentler more uniform slopes, but the basic drainage network would be restored. Following reclamation, the average surface elevation would be approximately 36 ft lower due to removal of the coal. (The removal of the coal would be partially offset by the swelling that occurs when the overburden and interburden are blasted and removed.) The land surface would be restored to the approximate original contour or to a configuration approved by WDEQ/LQD during the permit revision process.

Direct adverse impacts resulting from topographic moderation would include a reduction in microhabitats (e.g., cutbank slopes) for some wildlife species and a reduction in habitat diversity, particularly a reduction in slope-dependent shrub communities and associated habitat. A potential indirect impact may be a long-term reduction in big game carrying capacity. A direct beneficial impact of the lower and flatter terrain would be reduced water runoff, which would allow increased infiltration and result in a minor reduction in peak flows. This may help counteract the potential for increased erosion that could occur as a result of higher near-surface bulk density of the reclaimed soils (see Section 4.1.3). It may also increase vegetative productivity, and potentially accelerate recharge of groundwater. The approximate original drainage pattern would be restored, and stock ponds and playas would be replaced to provide livestock and wildlife watering sources. These topographic changes would not conflict with regional land use, and the postmining topography would adequately support anticipated land use.

These impacts are occurring on the existing Antelope Mine coal leases as coal is mined and mined-out areas are reclaimed. Under the Proposed Action or Alternative 2, the area that would be permanently topographically changed would increase as shown in Table 4-1.

4.1.2 Geology and Minerals

Within the Horse Creek LBA Tract, mining would remove an average of 150 ft of overburden, 45 ft of interburden, and 75 ft of coal on about 2,041 acres under the Proposed Action or 2,358 acres under Alternative 2. These acreage figures represent the estimated area of actual coal removal under the Proposed Action and Alternative 2. Table 4-2 compares the estimated coal, overburden, and interburden thicknesses for the existing Antelope Mine coal leases with estimated coal overburden and interburden thickness for the Horse Creek LBA Tract.

The replaced overburden and interburden would be a relatively homogeneous (compared to the premining layered overburden and interburden) and partly recompacted mixture averaging about 234 ft in thickness. Approximately 246 million additional tons of coal would be mined under the Proposed Action, compared to 279 million tons under Alternative 2.

The geology from the base of the coal to the land surface would be subject to permanent change on the LBA tract under either action alternative. The subsurface characteristics of these lands would be radically changed by mining. The replaced overburden and interburden (spoil) would be a mixture of the geologically distinct layers of sandstone, siltstone, and shales that currently exist. The resulting physical characteristics would also be significantly altered.

Development of other minerals potentially present on the LBA tract could not occur during mining; however, development of these resources could occur following mining. CBM associated with the coal would be irretrievably lost as the coal is removed. There are currently no oil wells present on the

Table 4-2. Comparison of Existing and Proposed Antelope Mine Coal, Overburden, and Interburden Thicknesses

	1995 Permit Area[1]	**Antelope LBA Tract**	**No Action Alternative (Existing Permit Area)**	**Proposed Action Tract**	**Alternative 2 Tract**
Average Overburden Thickness[1] (feet)	83	110	86	150	150
Average Total Mineable Coal Thickness[1] (feet)	33	73.5	38	75	75
Average Interburden Thickness[1] (feet)	0	31	4	45	45

[1] There are two mineable coal seams at the Antelope Mine. One seam is mineable over most of the 1995 permit area. Two seams are mineable over most of the Antelope LBA Tract (leased in 1997) and the Horse Creek LBA Tract.

LBA tract, however, most of the rights to the federal oil and gas underlying the tract are under lease. Conflict could arise between oil and gas and coal lease holders. BLM is required to manage federal lands on a multiple use basis; 43 CFR 3400.1(b) provides that "the presence of deposits of other minerals...or production of deposits of other minerals shall not preclude the granting of an exploration license, a license to mine or a lease for the exploration, development or production of coal deposits on the same lands with suitable stipulations for simultaneous operations." The special stipulations that Wyoming BLM attaches to new coal leases include a stipulation relating to coal leases issued within producing oil and gas fields. In the event of a conflict, BLM policy is to encourage negotiation and resolution of resource recovery issues between the conflicting interests.

4.1.3 Soils

Under the currently approved mining and reclamation plan, approximately 5,172 acres of soil resources will be disturbed in order to mine the coal in the existing leases at the Antelope Mine (Table 4-1). Disturbance related to coal mining would directly affect an additional 3,190 acres of soil resources on and adjacent to the LBA tract under the Proposed Action or 3,581 acres under Alternative 2. The reclaimed soils would have different physical, biological, and chemical properties than the premining soils. They would be more uniform in type, thickness, and texture. Average topsoil thickness would be a fairly uniform 26 inches. Soil chemistry and soil nutrient distribution would be more uniform, and average topsoil quality would be improved because soil material that is not suitable to support plant growth would not be salvaged for use in reclamation. This would result in more uniform vegetative productivity on the reclaimed land. The replaced topsoil would support a stable and productive vegetation community adequate in quality and quantity to support the planned postmining land uses(wildlife habitat and rangeland).

Specific impacts to soil resources would include an increase in the near-surface bulk density of the reclaimed soil resources. As a result, the average soil infiltration rates would generally decrease, which would increase the potential for runoff and soil erosion. Topographic moderation following reclamation would potentially decrease runoff, which would tend to offset this potential increase in runoff due to decreased soil infiltration rates. The decrease in soil infiltration rates would not be permanent because revegetation and natural weathering action would form new soil structure in the reclaimed soils, and infiltration rates would gradually return to premining levels.

Direct biological impacts to soil resources would include a short-term reduction in soil organic matter, microbial populations, seeds, bulbs, rhizomes, and live plant parts for soil resources that are stockpiled before placement.

Sediment control structures would be built to trap eroded soil, revegetation would reduce wind erosion, and soil or overburden materials containing potentially harmful chemical constituents (such as selenium) would be specially handled. These measures are required by state regulations and are therefore considered part of the Proposed Action and alternatives.

4.1.4 Air Quality

WDEQ/AQD issued an air quality permit (MD-288) for the Antelope Mine on July 8, 1996. ACC was authorized to increase coal production from a maximum of 12 million tons per year to a maximum rate of 30 million tons per year. The actual production rate depends on market conditions and contracts. In 1998, ACC's production was 19.4 million tons. As shown on Table 2-1 of Chapter 2, anticipated annual production on the Antelope Mine including the Horse Creek LBA Tract is 30 million tons per year. Subject to market constraints, ACC plans to achieve its maximum permitted coal production rate by year 2004. Permits to increase coal production to 30 mmtpy are in place, but unless the Horse Creek Tract is acquired by ACC it is not likely that the investment in personnel and equipment will be made. As discussed in Chapter 2, coal production without the Horse Creek LBA Tract is projected to level off at 22 mmtpy.

Figure 4-1 was prepared using the air quality modeling analysis prepared by the Antelope Mine in 1996 and submitted to WDEQ/AQD as part of a mine permit renewal package (ACC 1996). The figure illustrates modeled PM_{10} conditions in the year 2002, which is the predicted worst-case scenario for the Antelope Mine.

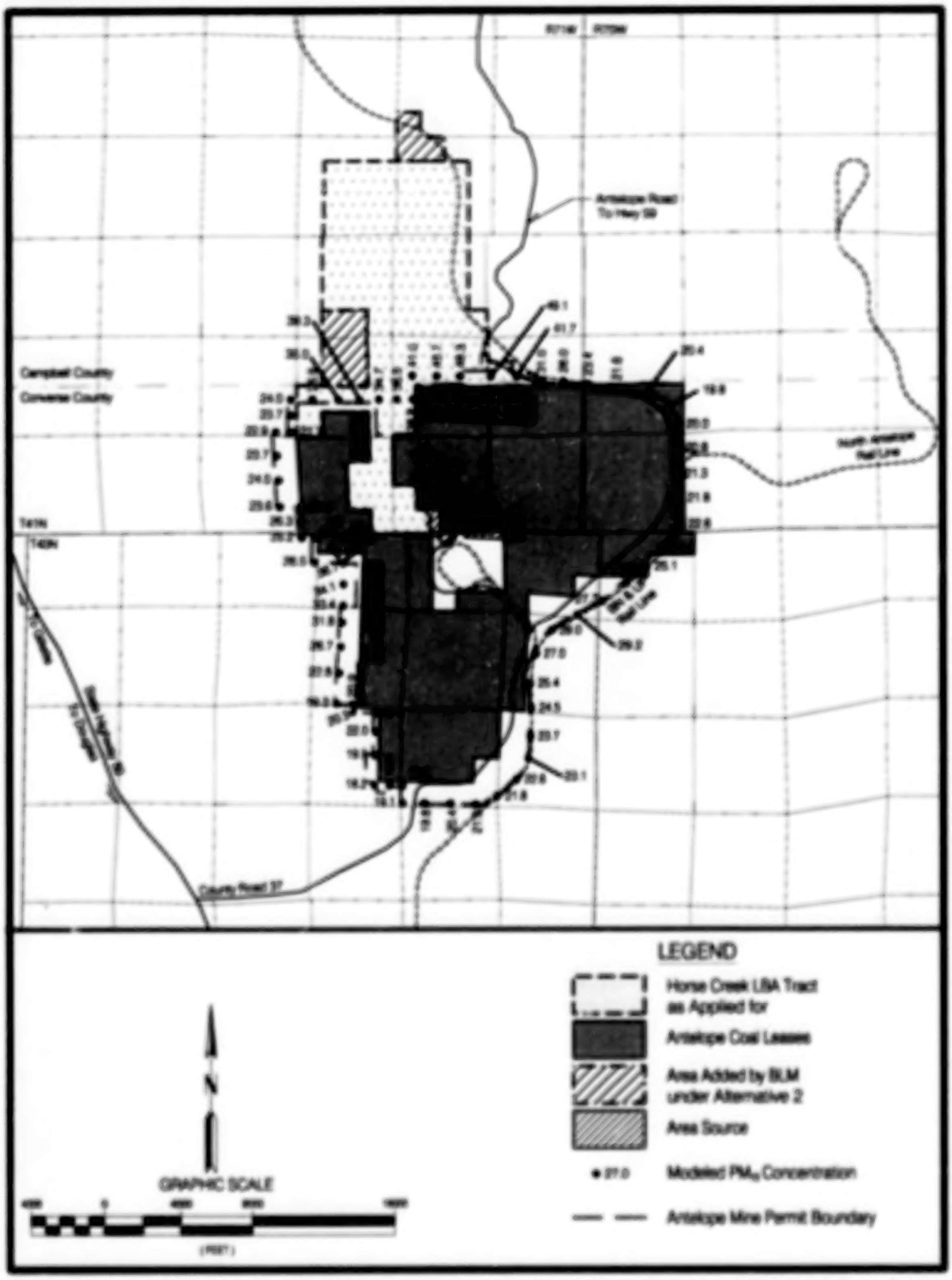


Figure 4-1. Modeled PM_{10} Concentrations at Antelope Mine Permit Boundary, Year 2002 Worst-Case Scenario Resulting from 30 Million Tons Per Year of Coal Removal from Existing Leases.

The figure indicates that at a coal removal rate of 30 mmtpy, PM_{10} concentrations are below 50 $\mu g/m^3$ (including 15 $\mu g/m^3$ background concentration) at the Antelope Mine permit boundary. If ACC acquires the Horse Creek LBA Tract, the PM_{10} concentrations shown on the edges of the existing Antelope Mine permit area would be shifted to the edges of the amended permit area which would include the Horse Creek LBA Tract, and mining at the Antelope Mine would be extended by 8 to 9 years. Concentrations above 50 $\mu g/m^3$ are predicted in the areas of active pit, but the state standard requires only that particulate concentrations above 50 $\mu g/m^3$ not be exceeded at the mine's permit boundary.

ACC's current air quality permit (MD-330 issued August 5, 1997) allows for a production rate of 30 mmtpy. The prior permit (MD-288 issued July 8, 1996) also allowed for a 30 mmtpy production rate. The differences between these two permits dealt with conveyor belt widths and control facilities such as baghouses. ACC's allowed production rate has been 30 mmtpy since permit MD-231 was issued on June 27, 1995; this permit allowed certain changes in the mine plan, an increase in maximum production rate from 12 to 30 mmtpy, and the construction of two additional coal storage silos.

Since changes in what was allowed between permits MD-288 and MD-330 were minor in terms of particulate emissions rates (only 9.26 additional tpy PM_{10}), modeling was not required for permit MD-330. Modeling for PM_{10} for permit MD-288 showed an annual average of 48.56 $\mu g/m^3$ for 1999, which was below the standard of 50$\mu g/m^3$ and therefore the permit could be approved. The computed average included a background concentration of 15$\mu g/m^3$.

Since February 2, 1996, AQD has required mines to model for NO_x. The NO_x inventory in the model must include mine-related vehicular tailpipe emissions, emissions from blasting and emissions from locomotive engines while these engines are on the mine property. ACC modeled NO_x for permit MD-288 but not for MD-330 since no changes in NO_x emissions were proposed. The NO_x modeling showed a 1999 average concentration of 31.6 $\mu g/m^3$ (background = zero) vs. a standard of 100$\mu g/m^3$.

The modeling and permit approval are done with the understanding that BACT will be applied. For Antelope Mine, BACT includes watering and/or chemical stabilization on topsoil removal areas, haul roads, and access roads; minimizing of blasting areas; minimizing the dragline drop distance; contemporaneous reclamation of disturbed areas; a negative pressure system and stilling shed for coal truck dumps; baghouses, covered conveyors , water sprays and storage silos for coal handling and storage; and enclosed chutes and dust return systems for the coal train loadout. In addition, baghouses must meet certain specifications regarding loading rates and opacity.

ACC would be required to modify their air quality permit to include mining in the Horse Creek LBA Tract. Provided the maximum production rate remains at 30 mmtpy and emissions of PM_{10} from point sources and truck dumps do not increase above 100 tpy (current levels are at 86.05 tpy for MD-330), modeling may or may not be required for this revision. Since the near-pit crusher and the conveyor would move to the Horse Creek Tract and the average stripping ratio would increase only about 5 percent, fugitive dust and gaseous pollutant emissions would be expected to remain within levels allowed by the current permit.

A surface coal mine is not a named facility under Wyoming's PSD regulations and therefore is not considered a "major emitting facility" unless it has the potential to emit 250 tons or more of any regulated pollutant. Fugitive dust emissions are not considered in determining potential to emit. Since ACC is a surface coal mine and its allowable point source PM_{10} and truck dumping TSP emission rates are estimated to be 86.05 tpy at its maximum production rate of 30 mmtpy, the mine is not considered a major emitting facility and an increment analysis under PSD regulations is not required.

Blasting is not a major source of emissions at PRB mines (PM_{10} emissions inventories show that overburden and coal blasting comprise less than one percent of the total emissions). Overburden removal, wind erosion, and coal haul roads generate the majority of dust. Antelope Mine has invested in conveyors to reduce the need for coal haul trucks, which also reduces dust emissions.

Air quality impacts resulting from, or associated with, mining operations would be limited primarily to the operational life of the mine. During the time the LBA tract is mined, the elevated TSP levels in the vicinity of the mining operations would continue, as would the elevated concentrations of gaseous emissions due to fuel combustion. Compliance with all state and federal air quality standards would be attained. As with current operations, mining would occur near County Road 37 and Antelope Road making dust visible to the public. The required mitigation measures, which are discussed in Section 4.3.4, would minimize this impact.

Impacts from the Proposed Action and Alternative 2 would not be substantially different, except that a slightly larger area would be mined under Alternative 2. Haul distances from the pit to the crushing facilities would increase slightly from current levels, so dust emissions may increase in proportion to this increased haul distance. As coal production shifts from existing leases to the Horse Creek Tract, ACC would move the conveyors to the north, helping limit increased fugitive dust from coal hauling.

The nearest Class I area is located approximately 80 miles east at Wind Cave National Park in southwestern South Dakota. Mines are not considered to be major emitting facilities in accordance with Section 24 of WDEQ/AQD Rules and Regulations. Therefore, mines are not required by the State of Wyoming to evaluate their impacts on that Class I area. However, BLM evaluates such issues for leasing. For this EIS regional air quality impacts are evaluated under cumulative impacts (Section 4.5).

4.1.5 Water Resources

Surface Water

Streamflows in Horse Creek would be diverted around the active mining areas in temporary diversion ditches or captured in flood-control reservoirs above the pit. If flood-control impoundments are used, it will be necessary to evacuate them following major events to provide space for the next flood.

Changes in runoff characteristics and sediment discharges would occur during mining of the LBA tract as a result of the diversions and the destruction and reconstruction of drainage channels as mining progresses. Erosion rates could reach high values on the disturbed area because of vegetation removal. However, both state and federal regulations require that all surface runoff from mined lands be treated as necessary to meet effluent standards. Therefore, the sediment would be deposited in ponds or other sediment-control devices inside the permit area. Sediment produced by large storms (i.e., greater than the 10-year, 24-hour storm) could adversely impact downstream areas. Since the tract would be mined as an extension of the existing Antelope Mine under the action alternatives, the amount of area disturbed and not reclaimed at any given time will not significantly increase due to leasing. WDEQ/LQD would also require a monitoring program to assure that ponds would always have adequate space reserved for sediment accumulation.

The loss of soil structure would act to increase runoff rates on the LBA tract in reclaimed areas. The general decrease in average slope in reclaimed areas, discussed in Section 4.1.1, would tend to counteract the potential for an increase in runoff. Soil structure would gradually reform over time, and vegetation (after successful reclamation) would provide erosion protection from raindrop impact, retard surface flows and control runoff at approximately premining levels.

After mining and reclamation are complete, surface water flow, quality, and sediment discharge from the LBA tract would approximate premining conditions. The impacts described above would be similar for both the Proposed Action and Alternative 2.

Groundwater

Mining the LBA tract would impact the groundwater resource quantity in two ways: 1) Mining would remove the coal aquifers and any overburden aquifers on the mined land and replace them with unconsolidated spoils; and 2) water levels in the coal and overburden aquifers adjacent to the mine would continue to be depressed as a result of seepage and dewatering from the open cut on the LBA tract. The area subject to lower water levels would be increased roughly in proportion to the increase in area affected by mining.

Mining the LBA tract would remove shallow aquifers on an additional 3,190 acres (Proposed Action) or 3,581 acres (Alternative 2) and replace the separate aquifer units with spoil composed of an unlayered mixture of the shale, siltstone, and sand that make up the existing Wasatch Formation overburden and Fort Union Formation interburden. Impacts to the local groundwater system resulting from mining include completely dewatering the coal, overburden and interburden within the area of coal removal, and extending drawdowns some distance away from the active mine area. The extent that drawdowns will propagate away from the mine pits is a function of the water-bearing properties of the aquifer materials. In materials with high transmissivity and low storativity, drawdowns will extend further from the pit face than in materials with lower transmissivity and higher storage. In general, due to the geologic makeup of the Wasatch Formation overburden (discontinuous sands in a matrix of shale), overburden drawdowns do not extend great distances from the active mine pit (Hydro Engineering 1997a). Of the four overburden wells monitored by ACC during 1997-1998, no significant water level changes were observed. Four interburden wells were monitored for water level in 1997-98. One shows total drawdown of about 25 ft, another shows about 7 ft of drawdown and the other two have not been affected by mining. The three underburden wells monitored for water level show declines of up to 32 feet.

Because of the regional continuity and higher transmissivity within the Wyodak coal seam, drawdowns propagate much further in the coal aquifer than in the overburden. Coal drawdowns from 1980 to 1995 are generally in excess of five ft within four miles of the active pits at the Antelope Mine (Hydro-Engineering 1996a).

In 1998 ACC monitored water levels in 15 monitor wells in the Anderson coal seam and 13 monitor wells in the Canyon coal seam. Water levels and maps showing drawdowns in the immediate vicinity of the pit are included in each year's annual report to WDEQ/LQD. As expected, drawdowns in the coal seam are a function of distance from the pit as well as geologic and hydrologic barriers and boundaries such as crop lines, fracture zones, and recharge sources. The maximum drawdown measured in an Anderson monitor well is about 22 feet, while in the Canyon seam drawdowns of over 75 feet have been measured. To date, mining has occurred in relatively dry portions of the Anderson coal seam, while the northeast part of the mine has encountered a fully saturated

Canyon seam. Drawdowns have resulted from mining and also from a series of dewatering wells installed to lower water levels in advance of the pit.

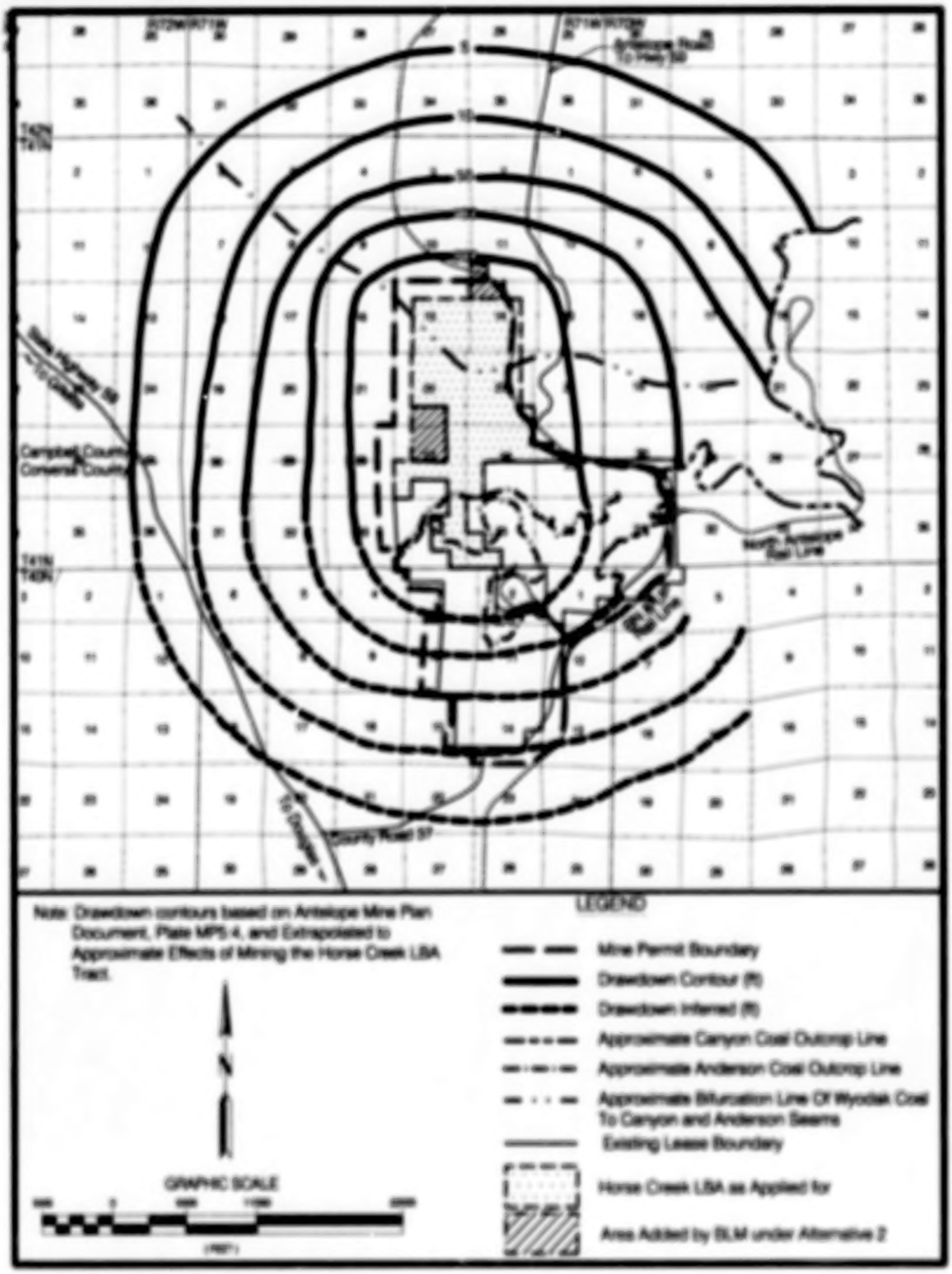
ACC used the MODFLOW model to predict the extent of water drawdown in the Canyon coal seam as a result of mining at the Antelope Mine. The results of the groundwater modeling are reported in Mine Plan Section MP 5.2 and Addendum MP-J of the Antelope Mine 525-T6 permit document (ACC 1998). Predicted drawdowns over the life of mine are shown on Figure 4-2. These predictions are approximate and were based on extrapolation of ACC's earlier predictions by extending the drawdowns westward and northward by the dimensions of the Horse Creek Tract. More precise predictions of the extent of drawdowns will be required in order to amend the Horse Creek LBA Tract into the WDEQ/LQD permit area.

Wyoming State Engineer's Office records indicate a total of 306 permitted water wells located within three miles of the LBA tract. The majority (258) are owned by coal mining companies and are used for groundwater monitoring and water supply. Of the 48 non mine-related wells, 43 are permitted for stock watering or domestic use, one for industrial use and two for miscellaneous use. The two remaining wells are used for monitoring purposes.

Some of these wells will likely be impacted (either directly by removal of the well or indirectly by water level drawdown) by approved mining operations occurring at Antelope and the adjacent mines. In compliance with SMCRA and Wyoming regulations, mine operators are required to provide the owner of a water right whose water source is interrupted, discontinued, or diminished by mining with water of equivalent quantity and quality; this mitigation is thus part of the action alternatives. The most probable source of replacement water would be one of the aquifers underlying the coal.

Drawdowns of groundwater levels due to mining at the Antelope Mine, including the Horse Creek LBA Tract, would reach their greatest extent in the Canyon coal seam. The drawdown in the Anderson coal seam will not extend beyond the eastern and southwestern boundaries of the mine because the Anderson seam is missing from these areas (see Figure 4-2). The Anderson seam is eroded away in some areas beneath Antelope Creek. Therefore, mining the Horse Creek LBA Tract will not extend the impacts to the Anderson seam south of Antelope Creek beyond what will occur due to the existing mine operation.

North of the Antelope Mine, but within the Horse Creek LBA Tract, the Canyon and Anderson coal seams merge to form the Wyodak coal seam (Denson et al. 1978). For the current mine area (without the Horse Creek LBA Tract), ACC determined that the effects of the predicted drawdown on possible neighboring groundwater



Note: Drawdown contours based on Antelope Mine Plan Document, Plate MP5.4, and Extrapolated to Approximate Effects of Mining the Horse Creek LBA Tract.

Figure 4-2. Life Of Mine Drawdown Map

users would be negligible. This determination was based on the finding that there were no known water users withdrawing water solely from the Anderson or Canyon coal seams to the west and northwest within the area of the 5-foot drawdown contour (ACC Permit 525-T6 Mine Permit Renewal Document, Mine Plan, p. MP5-66, Rev. 10/01/96).

In July 1999 the files of the SEO were searched to determine whether the preceding statement would still be true for the 5-foot drawdown as extrapolated on Figure 4-2 to consider mining of the Horse Creek LBA Tract. It was found that there were 10 permitted water supply wells within the expanded 5-foot drawdown contour with completion depths that indicated they produce water from the Anderson or Canyon coal seam (this excludes wells constructed only for the purpose of monitoring or mine dewatering). These wells are shown on Table 4-3. During the permitting process, the mine operator would be required to update the list of potentially impacted wells and predict impacts to these and other water-supply wells within the 5-foot drawdown contour. The operator would be required to commit to replacing these water supplies with water of equivalent quality and quantity if they are affected by mining.

The subcoal Fort Union aquifers are not removed or disturbed by coal mining, so they are not directly impacted by coal mining activity. Decreases in water levels in underburden monitoring wells are thought by ACC to be caused by depressurization associated with dewatering of the overlying coal. ACC has a water supply well completed in aquifers below the coal. If the LBA tract is leased by the applicant, water would be produced from this well for a longer period of time, but ACC would not require additional sub-coal wells to mine the LBA tract.

Mining would also impact groundwater quality; the TDS in the water resaturating the backfill is generally higher than the TDS in the groundwater before mining. This is due to the exposure of fresh overburden surfaces to groundwater that moves through the reclaimed spoils. Research conducted by the Montana Bureau of Mines and Geology on the coal fields of the northern PRB (Van Voast and Reiten 1988) indicates that upon initial saturation, mine backfill is generally high in TDS and contains soluble salts of calcium, magnesium and sodium sulfates. As the backfill resaturates, the soluble salts are leached by groundwater inflow and TDS concentrations tend to decrease with time, indicating that the long term groundwater quality in mined and off-site lands would not be compromised (Van Voast and Reiten 1988).

Groundwater quality within the backfill aquifer at the Horse Creek LBA Tract would be expected to be similar to the groundwater quality measured in wells completed in the backfill at nearby mines (data from four backfill wells completed in the

Table 4-3. Additional Water-Supply Wells Possibly Subject to Drawdown if Horse Creek LBA Tract is Mined.

SEO Permit No.	Applicant	Use	Yield (gpm)	Well Depth (ft)	Depth to Water (ft)
P95332W	F. Putnam	Domestic, Stock	20	480	50
P95333W	F. Putnam	Domestic, Stock	6	360	45
P58121W	Big Horn Fractionation	Miscellaneous	25	396	250
P109953W	P.L. Isenberger Litton	Misc., Stock	6	350	60
P23601P	P.L. Isenberger Litton	Stock	7	250	-1
P9571W	US Forest Service	Stock	4	495	0
P23599P	P.L. Isenberger Litton	Stock, Domestic	10	225	-1
P23600P	P.L. Isenberger Litton	Stock	7	300	100
P25606P	P.&E. Wilkinson	Stock, Domestic	2.5	220	100
P101690W	Land and Farm Office	Stock	10	334	250

Note: Wells in this table are believed from their completion depths to be completed in the Canyon or Wyodak coal seam, and are within the additional area of 5-feet or more drawdown caused by mining the Horse Creek LBA Tract. Wells impacted by the No-Action Alternative are already addressed in the state mine permit document.

southern portion of Antelope Mine will be available in the 1999 annual report). TDS concentrations observed in the backfill aquifers at mines surrounding the Horse Creek LBA Tract are generally higher than those found in the undisturbed Wasatch or Anderson and Canyon coal aquifers. At the nearby North Antelope/Rochelle Complex, 1996 TDS concentrations in the backfill were variable and ranged from 1,954 mg/L to 15,307 mg/L (Hydro Engineering 1997b) with a geometric mean of 4,339 mg/L. Five of the seven backfill wells present at the North Antelope/Rochelle Complex show decreasing TDS concentration with time, decreasing an average of 30 percent from 1986 to 1996. Using data compiled from ten surface coal mines in the eastern PRB, Martin et al. (1988) concluded that backfill groundwater quality improves markedly after the backfill is leached with one pore volume of water. The same conclusions were reached by Van Voast and Reiten (1988) after analyzing data from the Decker and Colstrip areas in the northern PRB. Postmining groundwaters are therefore expected to be of better quality after one pore volume of water moves through the backfill than what is observed in the backfill today. In general, the mine backfill groundwater TDS can be expected to range from 3,000 - 6,000 mg/L, similar to the premining Wasatch Formation aquifer, and meet Wyoming Class III standards for use as stock water.

The hydraulic properties of the backfill aquifer reported in permit documents of the nearby North Antelope/Rochelle Complex are variable but in general comparable to the Wasatch Formation overburden and Wyodak coal. At the North Antelope/Rochelle Complex, the backfill aquifer has been tested at four wells, and the average hydraulic conductivity is 36 ft/day, which exceeds the average hydraulic conductivity (9.5 ft/day) reported for the Wyodak coal in the vicinity of the North Antelope/Rochelle Complex. The data available indicate that the hydraulic conductivity of the backfill would be greater than or equal to premining coal values, suggesting that wells completed in the backfill would provide yields greater than or equal to premining coal wells.

Direct and indirect impacts to the groundwater system resulting from mining the LBA tract would add to the cumulative impacts that will occur due to mining existing leases. These impacts are discussed in section 4.5.5.

4.1.6 Alluvial Valley Floors

Certain reaches of Antelope Creek and Horse Creek within the current Antelope Mine permit boundary have been declared AVF's. Portions of these declared AVF's are within the LBA tract. Impacts to designated AVF's are generally not permitted if the AVF is determined to be significant to agriculture. The WDEQ/LQD has determined that potential AVF's on Antelope Creek and Horse Creek within the current Antelope Mine permit boundary are not significant to agriculture (WDEQ/LQD 1988). AVF's that are not significant to agriculture can be disturbed during mining, but they must be restored as part of the reclamation process. In order to restore the AVF, the physical and hydrologic characteristics of the AVF must be determined.

The mine permitting regulatory authorities (state and federal) have not yet formally declared whether or not there are any other AVF's within the LBA tract. However, along Horse Creek within the lease tract the agricultural uses appear similar to areas approved for mining downstream on the existing leases. Therefore, it is unlikely that any portions of the streams within the LBA tract meet the criteria to be AVF's significant to agriculture.

ACC's approved mining and reclamation plan avoids disturbing the Antelope Creek Valley. Therefore, portions of the Antelope Creek Valley within the Horse Creek LBA Tract would not be disturbed under any alternative. Consequently, disruptions to streamflows which might supply AVFs on Antelope Creek downstream of the Antelope Mine would not be expected to be significant. Groundwater intercepted by the mine pits would be routed through settling ponds to meet state and federal quality criteria, and the pond discharges would likely increase the frequency and amount of flows in these streams, which would increase surface water supplies to downstream AVF's.

If the LBA tract is mined as an extension of existing operations, the mining would extend upstream on streams already in the active mine areas. Therefore, no direct, indirect, or cumulative impacts are anticipated to off-site AVF's through mining of the LBA tract.

4.1.7 Wetlands

Existing wetlands along Antelope Creek would not be disturbed by mining. Existing wetlands elsewhere in the LBA tract would be destroyed by mining operations. COE requires replacement of all impacted jurisdictional wetlands in accordance with Section 404 of the Clean Water Act. Replacement of functional wetlands may occur in accordance with agreements with the private landowners; no federal surface lands are included in the Horse Creek LBA Tract. During the period of time after mining and before replacement of wetlands, all wetland functions would be lost. The replaced wetlands may not duplicate the exact function and landscape features of the premine wetlands.

4.1.8 Vegetation

Under the Proposed Action, mining of the LBA tract would progressively remove the native vegetation on 3,190 acres on and near the LBA tract. Acreage disturbed under Alternative 2 would be 3,581 acres. Short-term impacts associated with this vegetation removal would include increased soil erosion and habitat loss for wildlife and livestock. Potential long-term impacts include loss of habitat for some wildlife species as a result of reduced species diversity, particularly big sagebrush, on reclaimed lands. However, grassland-dependent wildlife species and livestock would benefit from the increased grass cover and production.

Reclamation, including revegetation of these lands, would occur contemporaneously with mining on adjacent lands, i.e., reclamation would begin once an area is mined. Estimates of the time elapsed from topsoil stripping through reseeding of any given area range from two to four years. This would be longer for areas occupied by stockpiles, haulroads, sediment-control structures, and other mine facilities. Some roads and facilities would not be reclaimed until the end of mining. No new life-of-mine facilities would be located on the LBA tract under the action alternatives, in which the LBA tract would be mined as an extension of the existing Antelope Mine. Grazing restrictions prior to mining and during reclamation would remove up to 100 percent of the LBA area from livestock grazing. This reduction in vegetative production would not seriously affect livestock production in the region, and long-term productivity on the reclaimed land would return to premining levels within several years following seeding with the approved final seed mixture. Wildlife use of the area will not be restricted throughout the operations.

Re-established vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The majority of the approved species are native to the LBA tract. Initially, the reclaimed land would be dominated by grassland vegetation which would be less diverse than the premining vegetation. At least 20 percent of the area would be reclaimed to native shrubs at a density of one per square meter as required by current regulations. Estimates for the time it would take to restore shrubs to premining density levels range from 20 to 100 years. An indirect impact of this vegetative change could be decreased big game habitat carrying capacity. Following completion of reclamation (seeding with the final seed mixture) and before release of the reclamation bond (a minimum of ten years), a diverse, productive, and permanent vegetative cover would be established on the LBA tract. The decrease in plant diversity would not seriously affect the potential productivity of the reclaimed areas, and the proposed postmining land use (wildlife habitat and rangeland) should be achieved even with the changes in vegetation composition and diversity. Private landowners (see Figure 3-9) would have the right to manipulate the vegetation on their lands as they desire once the reclamation bond is released.

On average, about 150 acres of surface disturbance per year of mining would occur on the LBA tract at the proposed rate of production regardless of which action alternative is selected. By the time mining ceases, over 75 percent of these disturbed lands would have been reseeded. The remaining 25 percent would be reseeded during the following two to three years as the life-of-mine facilities areas are reclaimed.

The reclamation plans for the existing mine include steps to control invasion by weedy (invasive nonnative) plant species. The reclamation plans for the Horse Creek LBA Tract would also include steps to control invasion from such species. Native vegetation from surrounding areas would gradually invade and become established on the reclaimed land.

The climatic record of the western U.S. suggests that droughts could occur periodically during the life of the mine. Such droughts would severely hamper revegetation efforts during the drought years, since lack of sufficient moisture would reduce germination and could damage newly established plants. Same-aged vegetation would be more susceptible to disease than would plants of various ages. Severe thunderstorms could also adversely affect newly seeded areas. Once a stable vegetative cover is established, however, these events would have similar impacts as would occur on native vegetation.

Changes expected in the surface water network as a result of mining and reclamation would affect the re-establishment of vegetation patterns on the reclaimed areas to some extent. The postmining maximum slope would be 20 percent in accordance with WDEQ policy. The average reclaimed slope will not be known until WDEQ's technical review of the permit revision application is complete. No significant changes in average slope are predicted.

Following reclamation, the LBA tract would be primarily mixed prairie grasslands with graminoid/forb-dominated areas, and the overall species diversity would be reduced, especially for the shrub component. Jurisdictional wetlands would fall under the jurisdiction of the COE. Detailed wetland mitigation plans would be developed at the permitting stage to ensure no net loss of jurisdictional wetlands on the project area. Functional wetlands may be restored in accordance with the requirements of the surface landowner; there are no public lands included in the Horse Creek LBA Tract.

The decrease in plant diversity would not seriously affect productivity of the reclaimed areas, regardless of the alternative selected, and the proposed postmining land use (wildlife habitat and rangeland) would be achieved even with the changes in vegetative species composition and diversity.

Threatened, Endangered and Candidate Plant Species

Surveys to date have not revealed the presence of any T&E or candidate plant species on the Horse Creek LBA Tract. USFWS requirements mandate surveys for Ute Ladies Tresses in potential habitat before surface disturbing activities commence. If found, a mitigation plan would be required.

4.1.9 Wildlife

Local wildlife populations are directly and indirectly impacted by mining. These impacts are both short-term (until successful reclamation is achieved) and long-term (persisting beyond successful completion of reclamation). The direct impacts of surface coal mining on wildlife occur during mining and are therefore short-term. They include road kills by mine-related traffic, restrictions on wildlife movement created by fences, spoil piles and pits, and displacement of wildlife from active mining areas. Displaced animals may find equally suitable habitat that is not occupied by other animals, occupy suitable habitat that is already being used by other individuals, or occupy poorer quality habitat than that from which they were displaced. In the second and third situations, the animals may suffer from increased competition with other animals and are less likely to survive and reproduce. The indirect impacts are longer term and include loss of carrying capacity and microhabitats on reclaimed land due to flatter topography, less diverse vegetative cover, and reduction in sagebrush density.

These impacts are currently occurring on the existing leases as mining occurs. If the LBA tract is leased under the Proposed Action or Alternative 2, the area of mining disturbance would be extended onto the LBA tract and mining would be extended by up to nine years at the Antelope Mine.

Under the Proposed Action or Alternative 2, big game would be displaced from portions of the LBA tract to adjacent ranges during mining. Pronghorn would be most affected; however there is no crucial pronghorn habitat on the LBA tract. Mule deer and white-tailed deer would not be substantially impacted, given their infrequent use of these lands and the availability of suitable habitat in adjacent areas. The displacement would be incremental, occurring over several years and allowing for gradual changes in big game distribution patterns. Big game residing in the adjacent areas could be impacted by increased competition with displaced animals. Noise, dust and associated human presence would cause some localized avoidance of foraging areas adjacent to mining activities. On the existing leases, however, big game have continued to occupy areas adjacent to and within active mine operations, suggesting that some animals may become habituated to such disturbances.

Big game animals are highly mobile and can move to undisturbed areas. There would be more restrictions on big game movement on or through the tract, however, due to additional fences, spoil piles, and pits related to mining. During winter storms, pronghorn may not be able to negotiate these barriers. WDEQ guidelines require fencing to be designed to permit pronghorn passage to the extent possible.

Road kills related to mine traffic would be extended in the area by up to nine years.

After mining and reclamation, alterations in the topography and vegetative cover, particularly the reduction in sagebrush density, would cause a decrease in carrying capacity and diversity on the LBA tract. Sagebrush would gradually become re-established on the reclaimed land, but the topographic changes would be permanent.

Medium-sized mammals (such as lagomorphs, coyotes, and foxes) would be temporarily displaced to other habitats by mining, potentially resulting in increased competition and mortality. However, these animals would quickly rebound on reclaimed areas, as forage developed and small mammal prey species recolonized. Direct losses of small mammals would be higher than for other wildlife, since the mobility of small mammals is limited and many retreat into burrows when disturbed. Therefore, populations of such prey animals as voles and mice would decline during mining. However, these animals have a high reproductive potential and tend to re-invade and adapt to reclaimed areas quickly.

Mining the LBA tract would eliminate a small amount of potential sage grouse habitat. However, no sage grouse have been observed on or near the LBA tract during annual monitoring surveys for the adjacent Antelope Mine, and the nearest lek is five miles away. Thus, mining is not expected to impact sage grouse populations.

Regional raptor populations will not be deleteriously impacted by mining the LBA tract. However, individual birds or pairs may be impacted. As noted, one golden eagle pair and one great horned owl pair have nested on the LBA tract. Thirty-seven additional raptor nests are known in the vicinity of the LBA. Mining activity could cause raptors to abandon nests proximate to disturbance. There is an approved raptor mitigation plan for the existing Antelope Mine. If the LBA tract is leased, a raptor mitigation plan covering the Horse Creek LBA Tract would be developed during the mine permitting process. That plan, required by USFWS and WDEQ/LQD, would address the impacts of mining on nesting raptors. Foraging habitat for raptors would be reduced until revegetation can attract and support lagomorphs and small mammals, which serve as their prey. Raptors could be impacted by the construction or relocation of power lines, which can pose an electrocution hazard. The raptor mitigation plan includes provisions for protection from electrocution.

Displaced songbirds would have to compete for available adjacent territories and resources when their habitats are disturbed by mining operations. Where adjacent habitat is at carrying capacity, this competition would result in some mortality. Losses would also occur when habitat disturbance coincides with egg incubation and rearing of young. Impacts of habitat loss would be short-term for grassland species, but would last longer for tree- and shrub-dependent species. Several required measures would minimize these impacts. A diverse seed mixture planted in a mosaic with a shrubland phase would provide food, cover, and edge effect. Cottonwood plantings along reclaimed drainages would eventually restore perching and nesting sites for species that are restricted to wooded riparian areas.

Waterfowl and shorebird habitat on the LBA tract is minimal, and production of these species is very limited. Mining the LBA tract would thus have a negligible effect on migrating and breeding waterfowl. Sedimentation ponds created during mining would provide interim habitat for these fauna. WDEQ and the COE would also require mitigation of any disturbed wetlands during reclamation, which would minimize impacts.

A minimal amount of low-quality fish habitat will be impacted on the proposed lease. No perennial streams or reservoirs occur on the area. The only fish present are common, widespread species. Portions of creeks that are disturbed during mining will be restored during reclamation.

The impacts discussed above would apply to both action alternatives.

4.1.10 Threatened, Endangered, and Candidate Wildlife Species

T&E wildlife surveys specific to the proposed lease tract were conducted in the summer of 1999. No T&E species or critical habitat for T&E species were found (Baumann 1999).

There are no prairie dog colonies on the LBA tract, and surveys of nearby towns have produced no evidence of black-footed ferrets. Bald eagles could potentially nest or roost on the LBA tract; however, there are no concentrated food sources for eagles on the LBA tract and the loss of any potential prey habitat would be short-term. Peregrine falcon nesting habitat does not exist on the LBA tract, and there are no concentrated food sources for peregrines on the LBA tract.

Small portions of two known mountain plover use areas overlap the proposed lease. The current mining and reclamation plan for the Antelope Mine includes a habitat recovery replacement plan for the identified mountain plover use areas on the existing leases, and a similar plan would be required as part of the mine permit revision for all plover habitat identified on the Horse Creek LBA Tract. That plan, which would have to be approved by the USFWS, would be expected to reduce potential impacts to an acceptable level. No recent sightings of swift fox have been reported on or near the tract.

Few MBHFI depend on or regularly use the proposed lease. For the most part, mining will have negligible impacts on these species of concern. A plan to monitor MBHFI and a plan to mitigate potential impacts to MBHFI is included in the existing approved Antelope Mine mining and reclamation plan. A similar plan would be required by USFWS and WDEQ/LQD if the LBA tract is leased and when a mining and reclamation plan including the tract is submitted for approval.

4.1.11 Land Use and Recreation

The major adverse environmental consequences of the Proposed Action or Alternative 2 on land use would be reduction of livestock grazing, loss of wildlife habitat, and curtailment of oil and gas development on about 3,190 acres (Proposed Action) or about 3,580 acres (Alternative 2) during active mining. Wildlife (particularly big game) and livestock (cattle and sheep) use would be displaced while the tract is being mined and reclaimed.

No active or abandoned oil and gas wells are present on the LBA tract, so no production equipment would have to be removed prior to mining. New drilling would not be possible in areas of active mining, but could take place in areas not being mined or in reclaimed areas. Any CBM resources on the LBA tract associated with the coal would be lost as the coal is mined.

As discussed in Section 1.2 of this document, some of the lands included in the tract were managed by the USFS until recently when they were included as part of an exchange between the USFS and local landowners. As a result of this land exchange, there are currently no federal surface lands included in the LBA tract under any of the alternatives. Therefore, no federal land would be removed from public access if the Horse Creek LBA Tract is leased.

Hunting on the LBA tract would be eliminated during mining and reclamation. Pronghorn, mule deer, and white-tailed deer occur on and adjacent to the tract. Sage grouse, mourning dove, waterfowl, cottontail rabbit, and coyote also inhabit the tract.

Following reclamation, the land would be suitable for grazing and wildlife use, which are the historic land uses. Following reclamation bond release, management of the privately-owned surface would revert to the private surface owner.

4.1.12 Cultural Resources

All portions of the Proposed Action area, and all but forty acres of the Alternative 2 area, have been subjected to Class III inventory and SHPO consultation on site evaluations.

At this time, all eligible and/or unknown sites in Converse County have been subjected to additional data recovery action, and as a result, no additional work is needed on cultural sites in the Converse County portion of the LBA tract. After completion of the consultation with SHPO on the evaluation of all sites within the Campbell County portion of the tract, two sites in Campbell County are considered eligible for the NRHP.

Impacts to eligible or unevaluated cultural resources cannot be permitted. If unevaluated sites cannot be avoided, they must be evaluated prior to disturbance. If eligible sites cannot be avoided, a data recovery plan must be implemented prior to disturbance. Ineligible properties may be destroyed without further work.

The eligible sites on the Horse Creek LBA Tract which can not be avoided or which have not already been subjected to data recovery action would be carried forward in the mining and reclamation plan as requiring protective stipulations until a testing, mitigation or data recovery plan is developed to address the impacts to the sites. The Wyoming SHPO would consult with the lead federal and state agencies on the development of such plans and the manner in which they are carried out.

Cultural resources adjacent to the mine areas may be impacted as a result of increased access to the areas. There may be increased vandalism and unauthorized collecting associated with recreational activity and other pursuits outside of but adjacent to mine permit areas.

4.1.13 Native American Concerns

No sites of Native American religious or cultural importance are known to occur on the LBA tract. If such sites or localities are identified at a later date, they will be taken into consideration.

4.1.14 Paleontological Resources

No unique or significant paleontological resources have been identified on the LBA tract, and the likelihood of encountering significant paleontological resources is small. Lease and permit conditions require that should previously unknown, potentially significant paleontological sites be discovered, work in that area shall stop and measures be taken to assess and protect the site (see Appendix D).

4.1.15 Visual Resources

Mining activities at the existing Antelope Mine are currently visible from County Road 37 and the Antelope Road, and mining activities on the Horse Creek LBA Tract would also be visible from these local access roads.

Mining would affect landscapes classified by BLM as VRM Class IV, and landscape character would not be significantly changed following reclamation. No unique visual resources have been identified on or near the Horse Creek LBA Tract.

Reclaimed terrain would be almost indistinguishable from the surrounding undisturbed terrain. Slopes might appear smoother (less intricately dissected) than undisturbed terrain to the north and west, and sagebrush would not be as abundant for several years; however, within a few years after reclamation, the mined land would not be distinguishable from the surrounding undisturbed terrain except by someone very familiar with landforms and vegetation.

4.1.16 Noise

Noise levels on the LBA tract would be increased considerably by mining activities such as blasting, loading, hauling, and possibly in-pit crushing. Since the LBA tract would be mined as an extension of existing operations under the action alternatives, no rail car loading would take place on the LBA tract. The Noise Control Act of 1972 indicates that a 24-hour equivalent level of less than 70 dBA prevents hearing loss and that a level below 55 dBA, in general, does not constitute an adverse impact. OSM prepared a noise impact report for the Caballo Rojo Mine (OSM 1980) which determined that the noise level from crushers and a conveyor would not exceed 45 dBA at a distance of 1,500 ft. Explosives would be used during mining to fragment the overburden and coal and facilitate their excavation. The air overpressure created by such blasting is estimated to be 123 dBA at the location of the blast. At a distance of approximately 1,230 ft, the intensity of this blast would be reduced to 40 dBA. Since the nearest occupied dwelling is over one mile away from the LBA tract, there should be no significant noise impacts.

Because of the remoteness of the site and because mining is already ongoing in the area, noise would have little off-site effect. Wildlife in the immediate vicinity of mining may be adversely affected; however, observations at other surface coal mines in the area indicate that wildlife generally adapt to increased noise associated with active coal mining. After mining and reclamation are completed, noise would return to premining levels.

4.1.17 Transportation Facilities

No new or reconstructed transportation facilities would be required under the Proposed Action or Alternative 2. Essentially all of the coal mined on the LBA tract would be transported by rail. Leasing the LBA tract would extend the length of time that coal is shipped from the permitted Antelope Mine. Traffic to and from the mine would continue at existing or slightly higher levels for an additional 8 or 9 years, depending on which alternative is selected.

An active pipeline currently crosses the LBA tract, and any relocation of the pipeline would be handled according to specific agreements between the coal lessee and the pipeline owner if the need arises. The Wyoming Department of Transportation routinely monitors traffic volumes on area highways, and if traffic exceeds design standards improvements are made. Burlington Northern-Santa Fe and Union Pacific have upgraded and will continue to upgrade their rail capacities to handle the increasing coal volume projected from the southern PRB with or without the leasing of the proposed LBA tract.

4.1.18 Socioeconomics

Leasing and subsequent mining of the LBA tract would extend the life of the already permitted Antelope Mine by eight to nine years.

Coal prices are currently projected to remain relatively constant throughout the life of the mine (WSGS 1999). Assuming a price of $4.00 per ton, the revenue from the sale of the recoverable coal from the LBA tract would total $984 million for the Proposed Action (246 million tons of coal) or $1.1 billion for Alternative 2 (278.7 million tons of coal). Some of this money from the sale of this federal coal would be paid to federal, state and local governments in the form of taxes and federal production royalties, as discussed below.

The federal government would collect a royalty at the time the coal is sold. This royalty is 12.5 percent of the sale price of the coal. This would amount to approximately $123 million under the Proposed Action, or $139.5 million under Alternative 2. This money would be split equally between the state and federal governments. The federal government would also collect black lung and reclamation taxes based on the sale of the coal.

According to a study done by the University of Wyoming (UW 1994), the State of Wyoming received about $1.10 per ton from the sale of PRB coal produced in 1991. The taxes and royalties included in this calculation were severance taxes, ad valorem taxes, sales and use taxes, and the state's share of federal royalty payments on production (discussed above). Under this scenario, the estimated total direct return to the State of Wyoming from the production of this federal coal would be $270.6 million under the Proposed Action, or $306.6 million under Alternative 2. This figure includes half of the federal royalty discussed above.

The federal government also receives a bonus payment at the time the federal coal is leased. Bonus payments on the federal coal leases issued in the Powder River Basin since 1990 have ranged from 11.1 cents per ton to 38.3 cents per ton. This range of bonus payments would represent a potential bonus payment range of $27 million to $106 million for the estimated federal coal tonnage in the Horse Creek LBA Tract. The actual amount the federal government would receive would depend on the alternative selected and the actual bonus bid if the tract is leased. The bonus payment would be payable over five years and would be divided equally with the State of Wyoming.

If the LBA tract is leased under an action alternative and coal production increases as projected, ACC anticipates that total employment at the Antelope Mine would increase by up to 70 employees, which would result in a total employment of 250 at the Antelope Mine over the 8 to 9 years the tract is being mined. Seventy persons represents less than one half of one percent of the 26,065 persons in the April 1999 labor force in Campbell and Converse Counties (Wyoming Employment Resources Division, June 1999). Considering that the April 1999 unemployment in these counties was 1,369, it appears that the labor force could absorb the projected potential increase in employment. As a result, no additional demands on the existing infrastructure or services in these communities would be expected because no influx of new residents would be needed to fill new jobs. The economic stability of the communities of Douglas, Wright, and Gillette would benefit by having the Antelope Mine employees living in their communities employed for an additional 8 to 9 years.

Issues relating to the social, cultural, and economic well-being and health of minorities and low-income groups are termed Environmental Justice issues. In reviewing the impacts of the Proposed Action and Alternative 2 on socioeconomic resources, surface water and groundwater quality, air quality, hazardous materials, or other elements of the human environment in this chapter, it was determined that potentially adverse impacts do not disproportionately affect Native American tribes, minority groups and/or low-income groups.

With regard to Environmental Justice issues affecting Native American tribes or groups, the general analysis area contains no tribal lands or Native American communities, and no treaty rights or Native American trust resources are known to exist for this area.

Implementing any of the alternatives would have no effects on Environmental Justice issues, including the social, cultural, and economic well-being and health of minorities and low income groups within the general analysis area.

4.1.19 Hazardous and Solid Waste

If ACC acquires the Horse Creek LBA tract, the wastes that would be generated in the course of mining the tract would be similar to the wastes that are currently being generated by the existing mining operation. The procedures that are used for handling hazardous and solid waste at the existing Antelope Mine are described in Chapter 2. Wastes generated by mining the LBA tract would be handled in accordance with the existing regulations using the procedures currently in use at the Antelope Mine, as described in Chapter 2.

4.2 No-Action Alternative

Under the No-Action Alternative, the coal lease application would be rejected and the area contained in the application would not be offered for lease at this time. For the purposes of this analysis, the No-Action Alternative assumes that these lands would never be mined. However, the approved mining operations for the existing Antelope Mine would not be changed if this alternative is chosen. The impacts described on the preceding pages and in Table 2.3 to topography and physiography, geology and minerals, soils, air quality, water resources, alluvial valley floors, wetlands, vegetation, wildlife, threatened, endangered and candidate species, land use and recreation, cultural resources, Native American concerns, paleontological resources, visual resources, noise, transportation, and socioeconomics would occur on the existing Antelope coal lease under the No-Action Alternative, but these impacts would not be extended onto the LBA tract.

The general nature and magnitude of cumulative impacts as summarized in Table 2.5, which would occur from implementation of the Proposed Action or Alternative 2, would not be substantially different under the No-Action Alternative. However, coal removal and the associated disturbance and impact would not occur on the 3,190 to 3,581 additional acres disturbed in the Proposed Action or Alternative 2, respectively. A portion of the Horse Creek LBA Tract adjacent to the existing Antelope Mine would be disturbed to recover the coal in the existing leases. The economic benefits that would be derived from mining the LBA tract during an additional nine years of mining would be lost. Without the LBA tract, operations at Antelope Mine would end in about 2006, when the existing leases are mined out. Not leasing this tract at this time could result in a bypass of this federal coal if the lease is not sold while the existing mine is still in operation and pits are in a position to be expanded into the LBA area.

4.3 Regulatory Compliance, Mitigation, and Monitoring

In the case of surface coal mining, SMCRA and state law require a considerable amount of mitigation and monitoring. Measures that are required by regulation are considered to be part of the Proposed Action and Alternative 2. These requirements, mitigation plans, and monitoring plans are in place for the No-Action alternative, as part of the current approved mining and reclamation plan for the existing Antelope Mine. If the Horse Creek LBA Tract is leased, these requirements, mitigation plans, and monitoring plans would be part of a mining and reclamation covering the Horse Creek LBA Tract. This mining and reclamation plan would have to be approved before mining could occur on the tract, regardless of who acquires the tract. The major mitigation measures and monitoring measures that are required by state or federal regulation are summarized in Table 4-4. Some of these mitigation and monitoring measures are also described in the resource discussions in Section 4-1 of this document.

If impacts are identified during the leasing process that are not mitigated by existing required mitigation measures, then BLM can include additional mitigation measures as stipulations on the new lease. No mitigation or monitoring measures beyond those required by SMCRA or state law have been identified as necessary for the LBA tract at this time.

4.4 Residual Impacts

Residual impacts are unavoidable impacts that cannot be mitigated and would therefore remain following mining and reclamation.

4.4.1 Topography and Physiography

Topographic moderation is a permanent consequence of mining. The indirect impacts of topographic moderation on wildlife habitat diversity would also be considered permanent.

4.4.2 Geology and Minerals

Geology from the base of the coal to the surface would be subject to significant, permanent change.

4.4.3 Soils

Existing soils would be mixed and redistributed, and soil-forming processes would be disturbed by mining. This would result in long-term alteration of soil characteristics.

4.4.4 Air Quality

No residual impacts to air quality would occur following mining.

4.4.5 Water Resources

The area where groundwater drawdowns and replacement of coal and overburden with spoils occur

Table 4-4. Regulatory Compliance, Mitigation and Monitoring Measures required under the Proposed Action, Alternative 1 (No Action), or Alternative 2

RESOURCE	Regulatory Compliance or Mitigation Required by Stipulations or Required by State or Federal Law[1]	MONITORING[1]
Topography & Physiography	Restoring to approximate original contour or other approved topographic configuration	LQD checks as-built vs. approved topography with each annual report.
Geology & Minerals	Identifying & selectively placing or mixing chemically or physically unsuitable overburden materials to minimize adverse effects to vegetation or groundwater	LQD requires monitoring in advance of mining to detect unsuitable overburden.
Soil	Salvaging soil suitable to support plant growth for use in reclamation; Protecting soil stockpiles from disturbance and erosional influences; Selectively placing at least 4 ft of suitable overburden on the graded spoil surface below replaced topsoil to meet guidelines for vegetation root zones	Monitoring vegetation growth on reclaimed areas to determine need for soil amendments. Sampling regraded overburden for compliance with root zone criteria.
Air Quality	Dispersion modeling of mining plans for annual average particulate pollution impacts on ambient air; Using particulate pollution control technologies; Using work practices designed to minimize fugitive particulate emissions; Using EPA- or state-mandated BACT, including: Fabric filtration or wet scrubbing of coal storage silo and conveyor vents, Watering or using chemical dust suppression on haul roads and exposed soils, Containment of truck dumps and primary crushers; Covering of conveyors, Prompt revegetation of exposed soils	On-site air quality monitoring for PM_{10} or TSP; Off-site ambient monitoring for PM_{10} or TSP; On-site compliance inspections
Surface Water	Building and maintaining sediment control ponds or other devices during mining; Restoring approximate original drainage patterns during reclamation; Restoring stock ponds and playas during reclamation	Monitoring storage capacity in sediment ponds; monitoring quality of discharges; monitoring streamflows and water quality.
Groundwater Quantity	Evaluating cumulative impacts to water quantity associated with proposed mining; Replacing existing water rights that are interrupted, discontinued, or diminished by mining with water of equivalent quantity	Monitoring wells track water levels in overburden, coal, interburden, underburden, & backfill

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[1] These requirements, mitigation plans, and monitoring plans are in place for the existing Antelope Mine in their current approved mining and reclamation plan (the No-Action Alternative). If the Horse Creek LBA Tract is leased, these requirements, mitigation plans, and monitoring plans would be part of a mining plan revision covering the Horse Creek LBA Tract that must be approved before mining can occur on the tract under Alternative 1 or 2.

Table 4-4. Regulatory Compliance, Mitigation and Monitoring Measures required under the Proposed Action, Alternative 1 (No Action), or Alternative 2. (Continued)

RESOURCE	Regulatory Compliance or Mitigation Required by Stipulations or Required by State or Federal Law[1]	MONITORING[1]
Groundwater Quality	Evaluating cumulative impacts to water quality associated with proposed mining; Replacing existing water rights that are interrupted, discontinued, or diminished by mining with water of equivalent quality	Monitoring wells track water quality in overburden, coal, interburden, underburden, & backfill
Alluvial Valley Floors	Identifying all alluvial valley floors that would be affected by mining; Determining significance to agriculture of all identified alluvial valley floors affected by mining (WDEQ); Protecting downstream alluvial valley floors during mining; Restoring essential hydrologic function of all alluvial valley floors affected by mining.	Monitoring to determine restoration of essential hydrologic functions of any declared AVF
Wetlands	Identifying all wetlands that would be affected by mining; Identifying jurisdictional wetlands (COE); Replacing all jurisdictional wetlands that would be disturbed by mining Replacing functional wetlands as required by surface managing agency or surface land owner	Monitoring of reclaimed wetlands using same procedures used to identify premining jurisdictional wetlands.
Vegetation	Permanently revegetating reclaimed areas according to a comprehensive revegetation plan using approved permanent reclamation seed mixtures consisting predominantly of species native to the area; Reclaiming 20% of reclaimed area with native shrubs at a density of one per square meter; Controlling erosion on reclaimed lands prior to seeding with final seed mixture using mulching, cover crops, or other approved measures; Chemically and mechanically controlling weed infestation; Direct hauling of topsoil; Selectively planting shrubs in riparian areas; Planting sagebrush; Creating depressions and rock piles; Using special planting procedures around rock piles; Posting reclamation bond covering the cost of reclamation	Monitoring of revegetation growth & diversity until release of final reclamation bond (minimum 10 years). Monitoring of erosion to determine need for corrective action during establishment of vegetation. Use of controlled grazing during revegetation evaluation to determine suitability for postmining land uses.

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[1] These requirements, mitigation plans, and monitoring plans are in place for the existing Antelope Mine in their current approved mining and reclamation plan (the No-Action Alternative). If the Horse Creek LBA Tract is leased, these requirements, mitigation plans, and monitoring plans would be part of a mining plan revision covering the Horse Creek LBA Tract that must be approved before mining can occur on the tract under Alternative 1 or 2.

Table 4-4. Regulatory Compliance, Mitigation and Monitoring Measures required under the Proposed Action, Alternative 1 (No Action), or Alternative 2. (Continued)

RESOURCE	Regulatory Compliance or Mitigation Required by Stipulations or Required by State or Federal Law[1]	MONITORING[1]
Wildlife	Restoring premining topography to the maximum extent possible; Planting a diverse mixture of grasses, forbs and shrubs in configurations beneficial to wildlife; Designing fences to permit wildlife passage; Raptor-proofing power transmission poles; Creating artificial raptor nest sites; Increasing habitat diversity by creating rock clusters and shallow depressions on reclaimed land; Cottonwood plantings along reclaimed drainages; Replacing drainages, wetlands and alluvial valley floors disturbed by mining; Reducing vehicle speed limits to minimize mortality; Instructing employees not to harass or disturb wildlife; Preparing raptor mitigation plans	Baseline & annual wildlife monitoring surveys; Monitoring for Migratory Birds of High Federal Interest
Threatened, Endangered, & Candidate Species	Avoiding bald eagle disturbance; Restoring bald eagle foraging areas disturbed by mining; Restoring mountain plover habitat disturbed by mining; Using raptor safe power lines; Surveying for Ute ladies' tresses; Surveying for mountain plover; Searching for black-footed ferrets if prairie dogs move onto tract;	Baseline and annual wildlife monitoring surveys
Land Use	Suitably restoring reclaimed area for historic uses (grazing and wildlife);	Monitoring of controlled grazing prior to bond release evaluation.
Cultural Resources	Conducting Class I & III surveys to identify cultural properties on all state and federal lands and on private lands affected by federal undertakings; Consulting with SHPO to evaluate eligibility of cultural properties for the NRHP; Avoiding or recovering data from significant cultural properties identified by surveys, according to an approved plan; Notifying appropriate federal personnel if historic or prehistoric materials are uncovered during mining operations; Instructing employees of the importance of and regulatory obligations to protect cultural resources	Monitoring of mining activities during topsoil stripping; cessation of activities and notification of authorities if unidentified sites are encountered during topsoil removal.

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[1] These requirements, mitigation plans, and monitoring plans are in place for the existing Antelope Mine in their current approved mining and reclamation plan (the No-Action Alternative). If the Horse Creek LBA Tract is leased, these requirements, mitigation plans, and monitoring plans would be part of a mining plan revision covering the Horse Creek LBA Tract that must be approved before mining can occur on the tract under Alternative 1 or 2.

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Table 4-4. Regulatory Compliance, Mitigation and Monitoring Measures required under the Proposed Action, Alternative 1 (No Action), or Alternative 2. (Continued)

RESOURCE	Regulatory Compliance or Mitigation Required by Stipulations or Required by State or Federal Law[1]	MONITORING[1]
Native American Concerns	Notifying Native American tribes with known interest in this area of leasing action and request for help in identifying potentially significant religious or cultural sites	No specific monitoring program
Paleontological Resources	Notifying appropriate federal personnel if potentially significant paleontological sites are discovered during mining	No specific monitoring program
Visual Resources	Restoring landscape character during reclamation through return to approximate original contour and revegetation with native species	No specific monitoring program
Noise	Protecting employees from hearing loss	MSHA inspections
Transportation Facilities	Relocating existing pipeline, if necessary, in accordance with specific agreement between pipeline owner and coal lessee.	No specific monitoring program
Socioeconomics	Paying royalty and taxes as required by federal, state, and local regulations.	Surveying and reporting to document volume of coal removed.
Hazardous & Solid Waste	Disposing of solid waste and sewage within permit boundaries according to approved plans; Storing and recycling waste oil; Maintaining of files containing Material Safety Data Sheets for all chemicals, compounds, and/or substances used during course of mining; Ensuring that all production, use, storage, transport, and disposal of hazardous materials is in accordance with applicable existing or hereafter promulgated federal, state, and government requirements; Complying with emergency reporting requirements for releases of hazardous materials as established in CERCLA, as amended; Preparing and implementing spill prevention control and countermeasure plans, spill response plans, inventories of hazardous chemical categories pursuant to Section 312 of SARA, as amended; Preparing emergency response plans;	No specific monitoring other than required by these other regulations and response plans.

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[1] These requirements, mitigation plans, and monitoring plans are in place for the existing Antelope Mine in their current approved mining and reclamation plan (the No-Action Alternative). If the Horse Creek LBA Tract is leased, these requirements, mitigation plans, and monitoring plans would be part of a mining plan revision covering the Horse Creek LBA Tract that must be approved before mining can occur on the tract under Alternative 1 or 2.

would be increased under the action alternatives compared to what would occur without the addition of the LBA tract. The postmining backfill may take in excess of 100 years to reach equilibrium water levels and water quality. Less time would be required near the mining boundaries. Water level and water quality in the backfill would be suitable to provide water to wells for livestock use, but would be different from premining conditions.

4.4.6 Alluvial Valley Floors

No residual impacts to alluvial valley floors would occur following mining.

4.4.7 Wetlands

Replaced wetlands (jurisdictional or functional) may not duplicate the exact function and landscape features of the premining wetland.

4.4.8 Vegetation

Reclaimed vegetative communities may never completely match the surrounding native plant community.

4.4.9 Wildlife

Although the LBA tract would be reclaimed to be as near original condition as possible, there would be some residual wildlife impacts. The topographic moderation would result in a permanent loss of habitat diversity and a potential decrease in slope-dependent shrub communities. This would reduce the carrying capacity of the land for shrub-dependent species.

4.4.10 Threatened, Endangered, and Candidate Species

No residual impacts to T&E or candidate species are expected.

4.4.11 Land Use and Recreation

No residual impacts to land use and recreation are expected.

4.4.12 Cultural Resources

Cultural sites that are determined to be eligible for the NRHP and that cannot be avoided are destroyed by surface coal mining after data from those sites is recovered. Sites that are not eligible for the NRHP are lost.

4.4.13 Native American Concerns

No residual impacts to Native American concerns are expected.

4.4.14 Paleontological Resources

No residual impacts to significant paleontological resources are expected.

4.4.15 Visual Resources

No residual impacts to visual resources are expected.

4.4.16 Noise

No residual impacts to noise are expected.

4.4.17 Transportation Facilities

No residual impacts to transportation facilities are expected.

4.4.18 Socioeconomics

No residual impacts to socioeconomics are expected.

4.5 Cumulative Impacts

Cumulative impacts result from the incremental impacts of an action added to other past, present, and reasonably foreseeable future actions, regardless of who is responsible for such actions. Cumulative impacts can result from individually minor, but collectively significant, actions occurring over time.

This section briefly summarizes the cumulative impacts that are occurring as a result of existing development in the area being mined and considers how those impacts would change if the Horse Creek LBA Tract is leased and mined and if other proposed development in the area occurs.

Important points to keep in mind include: 1) the total areas of all mines would not be disturbed at once; 2) the number of acres, type of vegetation, etc., disturbed would vary from year to year; 3) the impacts to groundwater would vary as mining progresses through each permit area (depending on saturation, how close the next mine pit is, etc.); and 4) the intensity and extent of CBM development is speculative.

Since decertification of the Powder River Federal Coal Region in 1990, the Wyoming State Office of the BLM has held twelve competitive coal lease sales and issued nine new federal coal leases containing approximately 2.365 billion tons of coal using the LBA process (Table 1-1). This leasing process has undergone the scrutiny of two appeals to the Interior Board of Land Appeals and one audit by the General Accounting Office.

The Wyoming BLM has received applications for four additional federal coal tracts containing over 1.75 billion tons of coal (Table 1-2). The PRRCT has reviewed three of these applications and recommended them for processing (Horse Creek, Belle Ayr and North Jacobs Ranch). All are maintenance tracts applied for by an adjacent mine. At its April 23, 1997 meeting in Casper, Wyoming, the PRRCT recommended that the BLM not start processing the New Keeline lease application for a new mine start. The BLM Wyoming State Director subsequently rejected that application without prejudice in a June 13, 1997 decision. The applicant (Evergreen Enterprises) has appealed the decision of the Wyoming State Director, and that appeal is pending. The North Jacobs Ranch LBA tract overlaps a portion of the area that was applied for in the New Keeline LBA Tract. Since the LBA sale process is a competitive bidding process, Evergreen Enterprises would have an opportunity to bid on the North Jacobs Ranch LBA tract if it is offered for sale. On July 26, 1999 BLM released a draft Environmental Assessment of a coal exchange (BLM 1999a). Under this exchange Enron would receive a federal lease for a 106-million ton portion of the Hay Creek Tract next to the Buckskin Mine in exchange for a 170-million ton coal lease near Buffalo, Wyoming that is unmineable due to construction of I-90.

The Wyoming and Montana BLM state offices completed a study entitled "*Powder River Basin Status Check*" in 1996. The purpose of this study was to document actual mineral development impacts in the PRB from 1980 to 1995 and compare them with mineral development impacts that were predicted to occur by 1990 in the five previously prepared PRB regional EIS's. Portions of the status check were updated prior to the 1997 and 1999 PRRCT public meetings in Casper, Wyoming and Billings, Montana.

Four of the previously prepared regional EIS's evaluated coal development in the PRB in Wyoming. They are:

Final Environmental Impact Statement, Eastern Powder River Coal Basin of Wyoming, BLM, October 1974;

Final Environmental Statement, Eastern Powder River Coal, BLM, March 1979;

Final Environmental Impact Statement, Powder River Coal Region, BLM, December, 1981; and

Draft Environmental Impact Statement, Round II Coal Lease Sale, Powder River Region, BLM, January 1984.

For Wyoming, the status check compared actual development in Campbell and Converse counties with predictions in the 1979 and 1981 Final EIS's, and USGS Water Resources Investigations Report 88-4046, entitled "*Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin*" (Martin, et al., 1988), which is frequently referred to as "the CHIA."

In 1998, Campbell and Converse Counties produced approximately 297.5 million tons of coal, according to the records of the Wyoming State Inspector of Mines. This is more than three times the total 1980 coal production of 94 million tons for the entire state. The increasing state production is primarily due to increasing sales of low-sulfur, low-cost PRB coal to electric utilities who must comply with Phase I requirements of Title III of the 1990 Clean Air Act Amendments. Electric utilities account for 97 percent of Wyoming's coal sales.

The currently operational mines in Campbell and northern Converse Counties are shown in Figure 1-1. Their current status and ownership are shown in Table 4-5. There have been numerous changes in mine ownership during the last decade, and this has resulted in mine consolidations and mine closings within the basin.

The mines are located just west of the outcrop of the Wyodak coal, where the coal is at the shallowest depth. The mines in Campbell and Converse counties produce 85 to 95 percent of the coal produced in Wyoming each year. Table 4-6 summarizes predicted coal mining activity (from

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Table 4-5. Status of Wyoming Powder River Basin Coal Mines

		Coal Production [1, 2]			Coal Production [1, 3]		
1999 Mine	**1994 Mine Operator**	**1993 Actual**	**1994 Permitted**	**1999 Mine Operator**	**1998 Actual**	**1999 Permitted**	**Status/Comments**
Buckskin	SMC (Zeigler)	11.18	24.0	Vulcan Coal	17.29	22.0	Active
Clovis Point	Kerr-McGee	0	4.0	Wyodak Resources	0	4.0	Mine shut down/leases relinquished or sold; facilities sold; Wyodak has AQD permit
Dry Fork	Phillips/WFA	3.28	15.0	WFA	1.03	15.0	Active
Eagle Butte	Cyprus-Amax	16.70	29.6	RAG American	18.07	35.0	Active
Fort Union	Fort Union Ltd	0.06	9.3	Kennecott/Kfx	0.05	9.4	Active
Rawhide	Carter (Exxon)	9.86	24.0	Peabody	5.39	24.0	Shut in
Wyodak	Wyodak Resources	3.03	10.0	Wyodak Resources	3.28	10.0	Active
NORTHERN MINE GROUP TOTALS		**44.11**	**115.9**		**45.11**	**119.4**	
Belle Ayr	Cyprus-Amax	15.59	25	RAG American	22.48	25	Active
Caballo/N. Caballo	Carter (Exxon)/ Western Energy	15.42	40	Peabody	25.98	51	Active/Caballo Mine + former Rocky Butte & West Rocky Butte leases
Cordero Rojo	Kennecott/ Drummond	21.01	44	Kennecott	36.98	60	Active/Cordero + Caballo Rojo Mines
Coal Creek	ARCO	0.11	18	Arch	7.07	18	Active
CENTRAL MINE GROUP TOTALS		**52.13**	**127**		**92.51**	**154**	
Antelope	Kennecott	7.29	12	Kennecott	19.42	30	Active
Black Thunder	ARCO	34.32	36	Arch	42.68	100	Active
Jacobs Ranch	Kerr-McGee	18.39	25	Kennecott	29.08	35	Active
N. Antelope/ Rochelle	Peabody	32.94	50	Peabody	64.64	65	Active/North Antelope Mine + Rochelle Mine
N. Rochelle	SMC (Zeigler)	0.02	8	Vulcan Coal	0.04	20	Active/facilities constructed in 1998-99
SOUTHERN MINE GROUP TOTALS		**92.96**	**131**		**155.86**	**250**	
TOTALS FOR 3 MINE GROUPS		**189.2**	**373.9**		**293.5**	**523.4**	

[1] Actual production (million tons) on left, permitted production (million tons) on right.
[2] Source: Wyoming State Geological Survey *GEO-NOTES*, August 1994.
[3] Source: *COAL OUTLOOK SUPPLEMENT*, August 9, 1999 and Wyoming State Inspector of Mines *ANNUAL REPORT* for 1998.

Table 4-6. Coal Production and Development Levels, Campbell and Converse Counties, Wyoming

	Coal Production (Million Tons)	Number of Active Coal Mines	Number of Existing Power Plants	Number of Active Coal Enhancement Facilities	Direct Coal Employment	Average Price-ne Wyoming
1979 Predictions for 1990	174.3	15	2	1	3,889	na
1981 Predictions for 1990	318.4	37	3	1	11,900	na
Actual 1990	162.6	18	3	1	2,862	$6.86
Actual 1994	216.9	19	4	1	3,126	$5.62
Actual 1995	246.5	19	4	1	3,177	$5.60
Actual 1996	261.1	18	4	2	3,274	$5.40
Actual 1997	264.1	18	4	2	3,164	$5.03
Actual 1998	297.5	16	4	2	3,348	$4.73
Potential by 1/1/2000	321.8	15	4	2	?	$4.66

Existing Power Plants:	PP&L Dave Johnson, PP&L Wyodak, Black Hills Simpson #1, and Black Hills Simpson #2
Proposed New Power Plants	NAPG Two Elk, Zeigler ENCOAL, and Calpine & Black Hills Wyodak #2
Existing Coal Enhancement:	ENCOAL-Buckskin and KFx-Fort Union
Proposed New Coal Enhancement	ENCOAL-North Rochelle

Sources: 1979 and 1981 BLM *Powder River Basin Regional EISs*, Wyoming State Geological Survey Geo-notes-1996-99, and Wyoming State Inspector of Mines Annual Reports, 1990-98 the 1979 and 1981 regional EIS's) with actual activity that has occurred since the EIS's were prepared.

Campbell and Converse counties' oil production decreased to 20.7 million barrels of oil in 1998 from 32.8 million barrels in 1992, a 36.9% decrease. Oil prices are currently very low, which suggests that this trend of decreasing oil production will continue in the foreseeable future.

Natural gas production has been increasing, particularly in Campbell County, due to the development of shallow CBM resources west of the coal mines. About 1,370 CBM wells had been drilled in the PRB in May 1999 (WOGCC 1999). Since 1990, five EA's and one EIS have been prepared to analyze the impacts of CBM development in Campbell County, and BLM is currently preparing another EIS and another EA analyzing the potential impacts of additional CBM wells in the Wyoming portion of the basin. The development of CBM was not anticipated when the regional EIS's were prepared.

Under the current process for approving CBM drilling, CBM wells can be drilled on private and state oil and gas leases after approval by the Wyoming Oil and Gas Conservation Commission and the Wyoming State Engineer's Office. On federal oil and gas leases, BLM must analyze the individual and cumulative environmental impacts of all drilling, as required by NEPA, before CBM drilling can be authorized. Approximately 88% of the coal rights in the Wyodak CBM project area shown in Figure 1-1 are federal, but only about half of the oil and gas rights in this area are federal. A recent Supreme Court decision (98-830, decided June 7, 1999) assigned the rights to develop CBM on a piece of land to the owner of the oil and gas rights.

Other mineral development levels in the Wyoming PRB are currently lower than predicted in the EIS's. In the 1970's, significant uranium development was anticipated in southwest Campbell County and northwest Converse County. This development did not materialize because the price of uranium dropped in the early 1980's. There are currently three *in situ* uranium operations in Converse and Johnson counties, but no mines and no mills. Uranium production has been increasing since 1990. The increase has been partially due to higher uranium prices, particularly in 1996 and 1997.

Scoria is quarried for use as road surfacing material, primarily by coal mines but also by a few excavation and construction firms. Bentonite is mined in parts of the Wyoming Powder River Basin, but not in Campbell or Converse Counties.

The proposed Horse Creek LBA Tract is situated within a nearly continuous corridor of five coal mines (counting the North Antelope/Rochelle Complex as one mine) in northern Converse and southern Campbell counties, Wyoming (see Figure 4-1). This southern mine corridor is approximately 24 miles long and eight miles wide. Production of coal in this southern mine group began in 1977 at the Black Thunder Mine. The current maximum permitted production rate for these five mines is 250 million tons per year (Table 4-5). Seven maintenance leases, including approximately 19,650 acres of federal coal, have been issued to mines in this southern group since decertification (Jacobs Ranch, West Black Thunder, North Antelope/Rochelle, Antelope, North Rochelle, Powder River, and Thundercloud--see Table 1-1). There are also two pending maintenance leases including approximately 7,660 acres of federal coal in this group of mines (Horse Creek and North Jacobs Ranch --see Table 1-2). The New Keeline LBA tract, located north of and adjacent to the Jacobs Ranch Mine (Figure 4-1), is also located in this mine corridor. The recently applied for North Jacobs Ranch LBA Tract partially overlaps the New Keeline LBA tract. As stated previously, the BLM Wyoming State Director rejected the New Keeline lease application in a 1997 decision which is under appeal.

At this time, CBM wells have been drilled west of the Jacobs Ranch, Black Thunder, and North Antelope/Rochelle Mines. Production from these wells has been delayed pending construction of additional pipelines in this area. CBM drilling and production is expected to continue in the area west of the coal mines. Due to the proximity of the coal mining and CBM production operations, cumulative impacts to groundwater, surface water, air quality and wildlife are likely to occur as more CBM resources are developed west of the southern mine group. These potential impacts are discussed in the following cumulative impact discussion for these resources.

In addition to the ongoing coal mining and leasing and the CBM development, four other projects were in progress or planned during preparation of this EIS in the vicinity of the southern mine group: 1) construction of the North Rochelle Mine facilities and rail loop; 2) construction and operation of the ENCOAL facilities within the rail loop at the North Rochelle Mine; 3) construction and operation of the Two Elk Power Plant east of the Black Thunder Mine; and 4) construction and use of the proposed DM&E rail line. These projects are considered in this cumulative impact discussion because, due to their locations, the impacts from these projects could overlap with the impacts of mining the Horse Creek LBA Tract.

Construction of the North Rochelle Mine facilities and rail loop began in June 1997 and was completed in mid-1999. The mine was not in production during most of the construction period, but production resumed on December 21, 1998.

The ENCOAL Plant could consist of three 5,500 ton/day parallel modules with an associated 240 Mw co-generation power plant. The power plant boiler would burn coal fines from the plant as well as some minor purge gas streams, and would produce enough electricity to run the ENCOAL Plant and the North Rochelle Mine. Excess electricity would be available for external sale. ENCOAL has submitted a request for amendment to the North Rochelle mining permit to WDEQ/LQD, since the ENCOAL Plant would be located within the rail loop at the North Rochelle Mine. ENCOAL is also pursuing a surface land exchange with the USFS because the proposed location for the ENCOAL facilities is on USFS surface. In addition, ENCOAL has filed a Permit Amendment Application with the Industrial Siting Division of WDEQ for the proposed LFC plant, and an air quality permit application with WDEQ/AQD. Other permits that will be obtained include a wastewater permit from WDEQ, a permit for a quantity of water from the Wyoming SEO, and various construction and waste disposal permits from the state and county.

The ENCOAL operations at the North Rochelle Mine would use up to 700 gpm of water. According to plans submitted to the Wyoming State Engineer (ENCOAL 1997), ENCOAL Corporation proposes to provide required industrial water for the ENCOAL plant by means of a two-phase approach. The Phase 1 industrial water supply would be based on use of groundwater from two existing wells in a local scoria aquifer during approximately the first eight years of plant operation. The Phase 2 industrial water supply would be based on use of groundwater from deeper aquifers during the remaining operational life of the plant if experience shows the scoria aquifer cannot continue to provide 700 gpm. The full life of the project is projected to be 30 years. This project is currently on hold and there is no proposed construction schedule at this time.

Two Elk would be a coal-fired power plant located east of Black Thunder Mine and would generate 250 Mw. The plant would burn low-Btu "waste coal" and coal fines as well as sub-bituminous coal in a pulverized coal boiler. This ability to burn low Btu waste coal and fines would allow the Two Elk plant to recover fuel values that might otherwise be lost and thereby generate electric power more efficiently than existing coal-fired plants. Coal and waste coal would be transported from the mine to the power plant by direct truck haul on unpaved roads, and ash would be returned to the mine by enclosed, 4-wheel off-highway trucks. An application for an air quality Permit to Construct was submitted to WDEQ and was deemed administratively complete on August 5, 1997. The Two Elk project received a Permit to Construct from WDEQ/AQD on February 27, 1998. The permittee has two years from the date of issuance to begin construction. No final decisions have been made as to how much water would be used, or where it would be obtained. Various scenarios for "wet" and "dry" operations are being evaluated at this time. Other permits that will be obtained include a wastewater permit from WDEQ and various construction and waste disposal permits from the state and county.

The Surface Transportation Board preliminarily approved the DM&E Railroad expansion plan (to build 262 miles of new track in the Powder River Basin and to rehabilitate 650 miles of track across South Dakota and Minnesota) on December 11, 1998. The approval was made pending the completion of an analysis of the environmental impacts of the project. The DM&E had proposed to start construction in 1999 and complete the new railroad line in 2001; however, final approval and construction cannot take place until after the environmental analysis is completed. The proposed route in Wyoming will generally follow along the Cheyenne River valley.

With the exception of some projected impacts to the labor and housing markets, none of the impacts to the physical environment projected by these projects would extend into the Horse Creek analysis area.

The status check identified one part of the coal mining process where the actual levels of development did not agree with the predictions, and this was the number of acres reclaimed. In general, coal mine reclamation efforts have been successful in both the Wyoming and Montana portions of the basin; however, as indicated in Table 4-7, the regional EIS's assumed that reclamation would proceed at a faster pace than has actually occurred.

Table 4-7 compares the 1979 and 1981 predictions of surface coal mining disturbance and reclamation areas with actual disturbance and reclamation areas. The EIS predictions are for the total area of disturbance that is available for reclamation and the area that has been reclaimed. The actual numbers, which are taken from the Annual Reports filed with WDEQ/LQD by each mine, show all acres of disturbance and acres seeded with final seed mixture. Since the EIS predictions for disturbed areas include only areas available for reclamation and the actual disturbed areas shown in Table 4-7 include areas that are not currently available for reclamation (mine facilities, rail facilities, roads, etc.), the numbers are not exactly comparable. To make them more comparable, the number of actual disturbed acres would be decreased to reflect the acres at each mine occupied by mine and rail facilities, roads, etc.; however those numbers have not been available for all mines in the annual reports. Also, since reclamation is a process involving many steps, and seeding with the final seed mixture happens near the end of the process, Table 4-7 shows the area that is currently almost completely reclaimed but it does not show the total number of acres that are being reclaimed at this time.

Table 4-7. Predicted and Actual Coal Mine Disturbance and Reclamation, Campbell and Converse Counties, Wyoming

Year	Surface Coal Mining Disturbance (Acres)*	Surface Coal Mining Reclamation (Acres)**	Percent Reclaimed
1979 EIS Prediction for 1990	22,794	12,666	55.57%
1981 EIS Prediction for 1990	48,400	34,100	70.45%
Actual 1990	31,797	6,994	22.00%
Actual 1996	47,018	12,165	25.87%
Actual 1997/98***	52,502	14,504	27.63%

* Includes all disturbance, including mine facilities, rail facilities, roads, sedimentation ponds, etc.

** Includes only acres seeded with permanent seed mixture, not all acres currently being reclaimed.

*** Based on most recent Annual Report submitted to WDEQ/LQD that is available for each mine.

For the southern group of mines, approximately 33% of the area of disturbance has been seeded with a final seed mixture.

At Antelope Mine, 285 acres were disturbed in 1997 and 129 acres were seeded to the permanent vegetation species. Cumulatively through September 30, 1998, a total of 3,059 acres had been disturbed at Antelope Mine and 558 acres had been reclaimed. Currently, WDEQ/LQD (1997) suggests to operators that only large, contiguous areas such as drainage basins be considered for bond release, with the assurance that the area will not be disturbed in the future. Because many mine plans cross a drainage basin several times during the life of mine, final reclamation of the drainage may not occur until late in the life of mine. This issue is further complicated when two operators are mining in the same drainage on different reclamation schedules, in that bond release for the first operator to mine the basin could be held until the second operator's portion of the basin is reclaimed. Due to the uncertainties involved the process of applying for and receiving final bond release, most companies are electing to postpone the initiation of bond release until late in the life of mine.

The development of reclamation schedules for PRB mines must take into account various unique factors:

- Very thick coal seams;
- Diverse premining topography;
- Surface-mining methods using trucks and shovels combined with draglines; and
- Large-volume material movements.

These factors affect the amount of reclamation that can be accomplished at any given time.

Achievement of final postmine topography immediately following mining is not always possible. The mining plan dictates the backfill placement and timing sequence and must take into account changing strip ratios which create material surpluses or deficits. Stockpiling, which may be required to fill final pit voids or store new pit boxcut material, affects the backfill material balance. Operating changes can also affect the backfill placement timing and sequence. Some examples include changing the pit direction to conform to lease configuration, changing plans to accommodate production growth and changes in technology or mining method. The achievement of contemporaneous reclamation is evaluated on a site-by-site basis by the WDEQ taking the mining complexities unique to each mine into account.

4.5.1 Topography and Physiography

Following surface coal mining and reclamation, topography will be modified in an elongated corridor east of and paralleling Highway 59 from just north of Gillette, Wyoming, south for about 75 miles. The topography in the PRB is characterized by relatively flat or rolling topography. After reclamation, these characteristics will be emphasized in the reclaimed area. Premining features that were more topographically unique (e.g., steeper hills and gullies, rock outcrops, etc.) will generally be smoothed. The reduction in topographic diversity may lower the carrying capacity for big game in the reclaimed areas; however, big game ranges are generally very large and mining activities are, in general, not located in habitats defined as crucial. The overall flattening and lowering of the topography would result in increased infiltration of surface water and reduced peak flows from the drainages. These changes would not be significant because the streams typically flow from west to east across the area rather than north to south along the entire corridor. Therefore, only a small part of each stream's drainage area would be disturbed (see Section 4.5.5). There would be no significant cumulative impacts to topography and physiography due to the proximity of coal mining, CBM development, and the proposed construction of the railroad line and ENCOAL and Two Elk power plants in this area because the construction and operation of those projects would cause minimal topographic and/or physiographic changes.

4.5.2 Geology and Minerals

The PRB coal region encompasses an area of about 20,000 mi^2 and contains nearly 240 billion tons of sub-bituminous coal resources (BLM 1979). Converse County has a total area of 4,050 mi^2 of which slightly less than one percent is within current permit boundaries. Campbell County has a total area of about 4,760 mi^2, of which approximately four percent is within current mine permit boundaries. Coal mining in this area disturbs about 2,000 acres annually with about 1,850 acres reclaimed annually (BLM 1996g). Mining and reclamation rates are expected to continue to increase through the year 2015, but the balance between reclamation and mining should remain about the same. In the PRB, the coal reserves currently leased represent a small percentage of the total coal reserves but a large percentage of the shallowest (hence the most economical to recover) coal reserves. Within the five southern mines, approximately 43,610 acres of federal coal are currently leased. This is about a 61% increase over the 27,160 acres of federal coal that were leased in the southern group of mines in 1990, prior to decertification. Under the Proposed Action, approximately 2,840 additional acres of federal coal would be leased, which would represent a 6.5% increase in the area of leased federal coal in the southern group of five mines. The area of disturbance associated with mining these leases, which would be greater than the leases themselves, is discussed in other parts of this analysis (e.g., section 4.5.3).

Coal and CBM are non-renewable resources that form as organic matter decays and undergoes chemical changes over geologic time. The CBM and coal resources that are removed would be used to generate power and would not be available for use in the future. Based on the information that is currently available, removal of the CBM and water from the coal prior to mining it does not damage the coal. Construction of the proposed railroad line and power plants would not impact the geology or mineral resources in the area, so there would be no overlapping impacts related to these projects.

4.5.3 Soils

The five existing southern mines as permitted would disturb approximately 38,000 acres throughout their combined lives (they would disturb about 1,200 acres annually during active mining at the currently planned mining rates). The recently leased North Rochelle, Powder River and Thundercloud LBA tracts have not yet been permitted. They would add an estimated total of about 11,000 additional acres of disturbance, which would bring the total disturbance in the southern mine group to approximately 49,000 acres. This is an increase of 29% in the estimated disturbance area over what is currently permitted for the southern mine group. If the Horse Creek LBA Tract is leased and mined, the disturbance area in the southern group of mines would increase by as much as 3,580 acres, to approximately 52,600 acres. This would represent an additional 7.3% increase in disturbance. Assuming ten years from initial disturbance to utilization of a parcel of reclaimed land by domestic livestock, approximately 12,000 acres (13 percent disturbed by Antelope) would be unavailable for such use at any given time during active mining. However, the replaced topsoil would support a stable and productive native vegetation community adequate in quantity and quality to support planned postmining land uses (i.e., wildlife habitat and rangeland).

Additional, although less extensive, soil disturbance would be associated with the proposed CBM development west of the mines, and with construction of the proposed power plants and railroad line.

4.5.4 Air Quality

According to current regulatory standards by which air quality is defined, surface mining and CBM development in the PRB have not resulted in impacts to air quality that have exceeded federal or state standards.

Based on predictive models conducted for PRB mines, mining operations do not have significant off-site particulate pollution impacts, even when production and pollution from neighboring mines are considered. However, this prediction has been based on the assumptions that mining activities are sufficiently removed from the permit boundaries and that neighboring mines are not actively mining in the immediate vicinity (within 0.6-2.5 miles). Previous modeling (BLM 1992a) has shown that incremental particulate pollution impacts decrease to insignificant levels (< 1 $\mu g/m^3$ PM_{10} annual average) within six miles of active mining.

In cases where mines are in close proximity (within two mi), WDEQ follows a modeling protocol which accounts for all mine-generated particulate air pollutants from all nearby mines to determine impacts to ambient air quality. Known as the "Mine A/Mine B" modeling procedure, this model evaluates the total impacts of a given mining operation, including those impacts from and on neighboring mines. In past modeling conducted in support of Antelope Mine's air quality permit, the Antelope Mine has not been subject to Mine A/Mine B protocol, but has been modeled alone due to its distance from its neighbors. If the LBA tract is leased under the Proposed Action or Alternative 2 and past procedures are followed, WDEQ would require that ambient air quality modeling be conducted only at the Antelope Mine for consideration of incorporation of the Horse Creek LBA Tract on air quality. The modeling protocol is restricted as a matter of state regulatory policy to evaluation of the average annual impacts with respect to the ambient standard of <50 $\mu g/m^3$ PM_{10}. The Wyoming air quality standard is 50 $\mu g/m^3$ which includes 15 $\mu g/m^3$ background concentrations.

A regional cumulative impact analysis was performed for this EIS to estimate impacts on air quality in the year 2015 from the Proposed Action and all other reasonably foreseeable actions. This analysis consisted of an update and modification to the May 1999 Wyodak CBM Project DEIS far-range cumulative air quality analysis (BLM 1999). No separate analysis was carried out to determine impacts of mining the Horse Creek LBA Tract alone; the only changes in air emissions due to mining the Horse Creek lease as an extension of Antelope Mine will be a small change in the location of Antelope Mine emissions, and a longer duration of mining activity at the Antelope Mine. Therefore there will be negligible change in long-term cumulative air impacts specific to the Horse Creek LBA Tract.

The regional (far-range) cumulative air quality analysis was carried out using the CALMET/CALPUFF model. Modeling was performed to estimate impacts of NO_x, SO_2 and particulate matter emissions on air quality, regional haze, and air quality related values (AQRVs) at Class I and sensitive Class II areas within approximately 150 miles (240 km) of Gillette, Wyoming. The area included in the model analysis is shown in Figure 4-3. The model analysis results presented in this section represent an indication of potential impacts based on currently available modeling technology and anticipated levels of activity in the year 2015 (see discussion below).

Cumulative Emissions Inventory

An inventory of incremental air pollutant emissions was prepared using 1995 as the base year and 2015 as the analysis year. The inventory utilized data assembled for the Wyodak CBM Project cumulative analysis, but included a number of updates and revisions to incorporate newly available information. The inventory included a breakdown of particulate matter emissions into three sub-groups: elemental carbon particles (EC), organic carbon particles (OC), and other undifferentiated particles, including fugitive dust (PM_{10}). The carbon particles, which are emitted primarily from diesel engines (mine equipment and trains), were treated separately because of their potential impact on regional haze. SO_2 emissions from blasting, trains and other diesel engines were also included, again because of potential regional haze impacts.

The four groups of air emission sources that were inventoried and the sources of emissions data relied upon are described below.

- All stationary point sources that began operation after 1995 and/or are permitted and reasonably expected to be operating after 1995. All permitted point source information was based upon state agency files, as obtained for the Wyodak CBM Project DEIS (BLM 1999).

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Transverse Mercator Projection
1927 North American Datum
Zone 13

Note: Map is from Wyodak CBM Project Air Quality Technical Reference Document (Greystone 1999)

Figure 4-3
Cumulative Air Quality Modeling Domain

- Potential incremental increase in surface coal mining emissions. Coal production in the year 2015 is projected to total 387 million tons per year for the PRB mines listed in Table 4-5 (Resource Data International 1998). This is about 30 percent more than the 1998 production and about 82 percent of the permitted production for active mines shown in Table 4-5. The permitted production is the regulatory limit based on present air quality permits. Thus, the reasonably foreseeable 2015 coal production assumed for the analysis represents about 82% of maximum permitted production.

  Incremental coal production from 1995 to 2015 was calculated for each of the 15 PRB mines active after 1999 (Table 4-5) by assuming 82% of permitted production in 2015. Emission increases for each pollutant were estimated based on the ratio of emissions to coal production as shown by the most recent air quality evaluation for each mine, or for a similar mine if recent data were unavailable. Planned major changes in mine plans (e.g. use of conveyors to replace haul trucks) were taken into account where applicable.

  NO_x is produced at mines by blasting, diesel equipment, and on-site locomotives. The expected decrease in NO_x emissions from diesel equipment engines due to new federal emission standards was taken into account in estimating 2015 incremental emissions.

  SO_2 emissions originate from blasting, diesel equipment, and locomotives at each mine. Incremental emissions were calculated from projected increases in fuel use, based on data in recent mine analyses for fuel use per unit of coal production.

  Particulate matter is generated at mines as fugitive dust (PM_{10}), and as engine emissions (a combination of PM_{10}, EC, and OC). Fugitive PM_{10} emissions per unit of coal production were calculated from recent data for each mine and used to estimate incremental emissions for 2015 production. Incremental emissions of PM_{10}, EC, and OC from engines were calculated from projected fuel use, using the proportions of each particulate component in diesel exhaust as given by EPA's source composition library.

- Coal transportation locomotive emissions. Emissions of NO_x, SO_2, and particulate matter (EC, OC, and PM_{10}) from coal train operations were calculated using EPA emission factors, locomotive fuel use, and the reasonably expected coal production for 2015. The proposed DM&E Railroad line was included in the analysis, using a potential route and number of trains suggested by DM&E. Fuel use and the fraction of total traffic on each of the existing BN and UP rail routes were provided by the railroads. Emissions assumptions and calculations were provided to BN, UP, and DM&E representatives for review prior to use for modeling. EPA's Tier I and Tier II emission standards for new and rebuilt locomotives were taken into account in calculating year 2015 emissions by use of EPA's projected fleet average emission factors for that year.

- Wyodak CBM sources. Emissions for the CBM development will originate from compressor engines (NO_x), vehicle tailpipe emissions (NO_x), road dust from vehicle traffic (PM_{10}), and fugitive dust from disturbed areas (PM_{10}). Total emissions from all of these sources were taken from the Wyodak CBM DEIS analysis (BLM 1999).

Total emissions from all sources and operations are shown in Table 4-8. These emissions were modeled as point and area sources, as appropriate, using the CALMET/CALPUFF modeling system, to estimate air quality impacts at the Class I and sensitive Class II areas shown on Figure 4-3.

Cumulative Air Quality Impacts

Based on the emission increase inventories for all regional sources, maximum 3-hour, 24-hour, and annual SO_2 impacts, 24-hour and annual PM_{10} impacts, and annual NO_2 impacts were modeled and compared to the PSD Class I increments at the Class I areas and to the National Ambient Air Quality Standards (NAAQS) at each sensitive Class II area. It is important to note that this is not a formal PSD increment analysis, and the references to PSD increments and NAAQS are intended only as a basis for comparison. The comparison does not constitute an air quality regulatory determination. Air quality standards are most stringent at Class I areas (National Parks and large designated wildernesses) to afford the most protection for these pristine areas. The results of the air quality analysis for each area are provided in Table 4-9, which demonstrates that maximum projected cumulative impacts are much smaller than regulatory standards and increments.

Regional Haze Impacts

Regional haze impacts were calculated based on cumulative emissions impacts (modeled concentrations of nitrate, sulfate, carbon, and other particulate matter) within the CALPUFF modeling

Table 4-8. Cumulative Pollutant Emissions for Far-Range Air Quality/AQRV Analysis

	Emissions after 1995 (tons/year)					**Percent of Total**				
Source	**NO_x**	**SO_2**	**EC**	**OC**	**PM_{10}**	**NO_x**	**SO_2**	**EC**	**OC**	**PM_{10}**
Wyodak CBM Sources										
Proposed Compressors	2,806					13.6	0.0	0.0	0.0	0.0
Road Dust from Vehicle Traffic					11,224	0.0	0.0	0.0	0.0	62.5
Fugitive Dust from Disturbed Areas					956	0.0	0.0	0.0	0.0	5.3
Project Vehicle Exhaust	18					0.1	0.0	0.0	0.0	0.0
Other Sources										
Other Point Sources	7,662	5,032			917	37.2	76.2	0.0	0.0	5.1
Coal Mines Incremental increase (NO_x from blasting, trains, vehicles)	2,860					13.9	0.0	0.0	0.0	0.0
Coal Mines Incremental increase of fugitive dust					4,703	0.0	0.0	0.0	0.0	26.2
Coal Mines Incremental increase from mining vehicles		679	187	71	83	0.0	10.3	54.2	53.8	0.5
Coal Trains Incremental increase	7,262	888	158	61	70	35.2	13.5	45.8	46.2	0.4
Total	20,608	6,599	345	132	17,953	100	100	100	100	100

domain. Extinction coefficients were computed and their effect on visibility assessed by comparison to background extinction coefficients corresponding to the mean of the cleanest 20% IMPROVE (Interagency Monitoring of Protected Environments) visibility data from Badlands National Park and the Bridger Wilderness. Seasonal average relative humidity values were used for the comparison.

Results of the regional haze analysis are shown in Table 4-10. Potential visibility reductions greater than the threshold values of 0.5 and 1.0 deciviews are indicated for all Class I and sensitive Class II areas. The number of days with an indicated potential change of one deciview or more ranges from four days in the Cloud Peak Wilderness to 70 days in Badlands National Park. It should be recognized that the analysis results reflect potential impacts at any one or more receptors in each area (not at all receptors), and that the indicated change is relative to the 20% of best

Table 4-9. Results of Air Quality Impact Analysis (µg/m³)

Area	**Annual NO_2**	**24-hr PM_{10}**	**Annual PM_{10}**	**3-hr SO_2**	**24-hr SO_2**	**Annual SO_2**
CUMULATIVE IMPACTS						
Northern Cheyenne Reservation, MT	0.03	0.58	0.02	1.60	0.56	0.01
Badlands National Park, SD	1.25	0.65	0.10	3.61	1.20	0.21
Wind Cave National Park, SD	0.15	0.62	0.06	2.17	0.84	0.08
Class I PSD Increment	**2.5**	**4**	**8**	**25**	**5**	**2**
Black Elk Wilderness, SD	0.09	1.04	0.05	2.48	0.79	0.07
Jewel Cave National Monument, SD	0.13	0.76	0.08	3.92	0.87	0.09
Mt. Rushmore National Monument, SD	0.08	1.01	0.05	1.93	0.55	0.06
Cloud Peak Wilderness, WY	0.01	0.90	0.04	1.08	0.32	0.01
Devils Tower National Monument, WY	0.12	0.80	0.16	2.84	0.50	0.06
National Ambient Air Quality Standard	**100**	**150**	**50**	**1300**	**365**	**80**

Table 4-10. Predicted Annual Days of Visibility Reductions At Class I and Class II Sensitive Areas from Cumulative Sources

Location	**Type of Area**	**Number of Days deciview change >0.5**	**Number of Days deciview change >1.0**
Northern Cheyenne Reservation	Class I	18	8
Badlands National Park	Class I	173	70
Wind Cave National Park	Class I	94	45
Black Elk Wilderness	Class II	66	28
Jewel Cave National Monument	Class II	72	32
Mt. Rushmore National Monument	Class II	58	22
Cloud Peak Wilderness	Class II	15	4
Devils Tower National Monument	Class II	70	28

Note: The Northern Cheyenne Reservation is a redesignated Class I area and is not addressed by existing visibility regulations which apply to the federally mandated Badlands and Wind Cave Class I areas.

visibility days in each area. On many of the days for which model-predicted impacts occur, natural atmospheric conditions and/or background air quality levels would result in lower background visibility. Thus, actual visibility impacts would be less than indicated by the model results.

The model predicts that Badlands National Park would experience the most significant visibility impacts in 2015. The indicated impacts in Badlands National Park are strongly influenced by the close proximity of the modeled DM&E rail route. The modeled route is only one of a number of potential routes, and may not be representative of the actual route to be selected, nor is the modeled number of daily trains necessarily realistic of 2015 DM&E traffic. The Badlands National Park results in Table 4-10 reflect data for those areas of the Park more than 20 km (12 mi) from the modeled rail route. The CALPUFF modeling system in the version applied in the present analysis is not appropriate for definition of impacts at shorter distances from linear sources such as railroads.

AQRV Impact (Acid Deposition)

In addition to evaluating potential impacts to visibility in Class I and sensitive Class II areas, an assessment of potential impacts to other AQRVs in these areas was performed. The AQRVs of concern for the Class I and sensitive Class II areas include soil, water, flora, and fauna. For impacts to AQRVs, other than visibility, acid deposition of nitrates and sulfates is of primary interest due to its effects on lake acidification, as well as possibly affecting flora and fauna.

The cumulative acid deposition analysis evaluated potential impacts to AQRVs by computing the amount of nitrogen and sulfur that would be deposited on land masses within the Class I and II areas. Additionally, the potential effects of acid deposition on Florence Lake (a sensitive lake located within Cloud Peak Wilderness, Wyoming) were also evaluated at the request of the FS. Nitrogen would originate from wet and dry deposition of nitrates and nitric acid, as well as dry deposition of NO_x. Sulfur would originate from wet and dry deposition of sulfates and SO_2.

To evaluate potential impacts to AQRVs, the wet and dry deposition of the nitrogen and sulfur- containing chemicals were computed using the CALPUFF model. Annual fluxes (mass per unit area) calculated for the Class I and sensitive Class II areas were compared to the limits of acceptable change (2.7 to 4.5 lb/acre/year) for evaluating effects on soil, flora, and fauna. The acid deposition calculations used in this analysis followed the procedures outlined in the IWAQM Phase 2 Report (USEPA 1998) and FS guidance.

To evaluate the impacts to aquatic systems (Florence Lake) from acid deposition, the loss of acidification neutralization capacity (ANC), in micro-equivalents per liter (μeq/L), was computed using FS methods (USFS 1987). Since the baseline ANC at Florence Lake is 37.6 µeq/L (USDA FS 1999), the limit of acceptable change in the ANC is 10 percent.

The results of the AQRV analysis for effects from acid deposition are summarized in Table 4-11. The maximum annual deposition fluxes of nitrogen and sulfur due to cumulative emissions are shown for each Class I and II area. As the data show, the highest nitrogen deposition would be 0.21 lb/acre/year, a value that is only eight percent of the lower limit of acceptable change.

The ANC calculation for Florence Lake showed that the expected change in ANC due to cumulative acid deposition impacts would be 0.07%, a value much lower than the limit of acceptable change (10%).

Discussion

The cumulative air quality impact analysis presented here indicates that impacts in Class I and sensitive Class II areas, based on reasonably expected pollutant emission increases through the year 2015, will be quite small with the exception of impacts on regional haze. The model results visibility days in each area. On many suggest that haze impacts may exceed Limits of Acceptable Change (LACs) on some days in all areas evaluated. It should be noted that the LACs for visibility impacts, as well as those for other AQRVs, are not regulatory limits, but represent federal land manager policies for evaluating impacts.

The model-predicted numbers of days of regional haze impacts should be interpreted only as an indication of possible impacts. There are many uncertainties involved in air quality model projections, particularly for long-range transport modeling over large areas with widely varying terrain and land surface characteristics. The CALPUFF modeling system is relatively new and its calculation algorithms and methods of application are still evolving. Results are subject to wide variability with the quality and quantity of input meteorological data, the accuracy of emission estimates, the form of representation of different types of

Table 4-11. Predicted Levels of Acid Deposition from Cumulative Sources (lb/acre/year)

Area	Significance Level	Total Nitrogen Deposition	Total Sulfur Deposition
Northern Cheyenne Reservation	2.7 - 4.5	0.060	0.010
Badlands National Park	2.7 - 4.5	0.212	0.067
Wind Cave National Park	2.7 - 4.5	0.059	0.054
Black Elk Wilderness	2.7 - 4.5	0.042	0.053
Jewel Cave National Monument	2.7 - 4.5	0.046	0.068
Mt. Rushmore National Monument	2.7 - 4.5	0.027	0.045
Cloud Peak Wilderness	2.7 - 4.5	0.004	0.006
Devils Tower National Monument	2.7 - 4.5	0.039	0.049

sources, chemical reaction and particle size assumptions, and other factors.

Some of the comments received on the CALPUFF cumulative analysis for the Wyodak CBM Project DEIS were considered and addressed in the present analysis, primarily through:

- updated evaluation of railroad and coal mine emissions
- addition of a potential DM&E railroad route
- distribution of future coal train traffic based on current distribution and DM&E projections
- addition of carbon particles as specific components of PM_{10}
- addition of SO_2 emissions from diesel engines
- simulation of coal train emissions by area sources rather than volume sources.

The changes and refinements used in this analysis were reviewed by a group of industry and agency representatives which included members of the interagency committee that developed the protocol for the Wyodak CBM Project DEIS, as well as Kennecott and DM&E Railroad. The Wyodak CBM Project DEIS interagency committee included representatives from the BLM, EPA, NPS, USFS, and the State of Wyoming.

There are additional refinements and/or improvements in model application that would lead to a better definition of potential future impacts. These include utilization of recent model refinements, incorporation of more sources of regional meteorological data, further refinement of emission estimates, and a better characterization of source parameters and geometries. In addition, further research is needed into the accuracy and appropriate interpretation of model results for regional haze. These improvements were beyond the scope of the present analysis but will be addressed in future regional impact analyses.

It should be noted that model-predicted impacts, especially in Badlands National Park, are affected by proximity to the modeled route of the DM&E railroad. The DM&E route and traffic volumes were provided as examples of a possible future scenario but are not yet determined. The model parameters utilized for DM&E are not necessarily indicative of what will be ultimately implemented. Thus, predicted impacts in Badlands NP and other sensitive areas proximate to the DM&E route are especially subject to future refinement. The CALPUFF model is a long-range transport model, and is not necessarily the best methodology for evaluating impacts at short distances (0 - 50 km). Since all of the Badlands receptors were within this distance from the hypothetical DM&E route, a more appropriate and detailed model approach would be in order if the eventual rail route passes this or other sensitive areas.

4.5.5 Water Resources

Surface Water

Surface coal mining reduces streamflows because of the regulations that require all runoff from disturbed areas to be captured and treated in sedimentation ponds. Also, the surface coal mine pits in the PRB are large, and these pits, together with ponds and diversions built to keep water out of the pits, can intercept the runoff from significant drainage areas.

Changes in drainage patterns and surface disturbance are decreasing and will continue to decrease flows in most of the ephemeral and intermittent drainages exiting the mine sites. Development of CBM resources in the area west of the mines could potentially increase surface flow in some drainages. Currently, there is little methane production occurring in the general analysis area. (Coal bed methane development was not considered in the CHIA (Martin et al. 1988)). The Gillette South Coal Bed Methane Project EIS (BLM 1997) estimates that an average surface discharge of 20 gpm from each of the 423 wells considered in that analysis would result in an increase in flow of 0.5 percent to 2.4 percent of the 2-year, 24-hour flood flows (per square mile) if all of the wells discharge into the same drainage basin. The amount of CBM produced water that ultimately reaches the major channels is reduced by evaporation, infiltration into the ground, and surface landowners, who sometimes divert the produced water into reservoirs for livestock use because it is of relatively good quality. The Wyodak Coal Bed Methane DEIS (BLM 1999) evaluates impacts of CBM production within a much larger project area, extending from over 30 miles north of Gillette to over 60 miles south of Gillette. The project area would extend westward from the PRB coal mine areas for a distance of 18 to 36 miles. The Wyodak CBM project area includes the Gillette South project area. The proposed action for the Wyodak CBM project includes 3,000 CBM wells that would each generate 12 gpm of water. This water would be discharged at an estimated 500 to 1,000 different locations over a period of 10 to 20 years. These water discharges would double the annual yield from the Upper Cheyenne drainages, in which the southern mine cluster including Antelope is located. These CBM water discharges would be constant, as opposed to naturally occurring flows which fluctuate widely on a seasonal and annual basis. Most streams in the area are naturally dry throughout most of each year.

The USGS has predicted that, after reclamation, major streams in the PRB will exhibit increased runoff ranging from 0.4 percent in the Cheyenne River to 4.3 percent in Coal Creek due to cumulative disturbance as a result of existing surface coal mining (Martin et al. 1988). This is based on the assumption that unit runoff rates will be increased after reclamation due to soil compaction, and the percentage changes in runoff are based on permitted mine acreages in 1981. The additional leases since that time have increased the permitted acreage by about 40 percent and would, under the same assumptions, increase the USGS's estimates of runoff increase by the same incremental amount. This minor increase in runoff is small compared to seasonal and annual variability of runoff in the PRB.

Drainage from all five southern mines combines where Black Thunder Creek enters the Cheyenne River. The drainage area of the Cheyenne River at this point is approximately 2,430 mi^2. The entire area of disturbance from these five mines as currently permitted would impact approximately two percent of the drainage basin of the Cheyenne River, and this disturbance would occur over about 50 years. Proposed LBA's, recently issued leases, and the New Keeline Mine would raise this disturbance acreage to roughly three percent of the Cheyenne River drainage basin at Black Thunder Creek.

Sediment concentrations should not increase significantly in area streams even with the addition of mining the pending and recently issued LBA tracts because, as discussed in Section 4.1.5, state and federal regulations require that all surface runoff from mined lands pass through sedimentation ponds. The potential for cumulative adverse impacts to the Cheyenne River drainage is also minimal because it is typically dry for a substantial portion of the year.

The CBM discharges could result in erosion and degradation of small drainages, which could affect water quality and channel hydraulic characteristics. From a surface water standpoint, the increased flows due to CBM discharges and the reduced flows due to surface coal mining will tend to offset each other. However, conflicts could also result. The CBM development takes place upstream from the mines. Provisions the mines have taken to prevent water from entering the pits (e.g., storage ponds or diversions) could be adversely affected by having to deal with flows that were not included in designs or that change conditions for future designs.

Groundwater

As a result of statutory requirements and concerns, several studies and a number of modeling analyses have been conducted to help predict the impacts of surface coal mining on groundwater resources in the Wyoming portion of the PRB. Some of these studies and modeling analyses are discussed below.

In 1987, the USGS, in cooperation with the WDEQ and OSM, conducted a study of the hydrology of the eastern PRB. The resulting description of the cumulative hydrologic effects of all current and anticipated surface coal mining (as of 1987) was published in 1988 in the USGS Water-Resources Investigation Report entitled "*Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin, Northeastern Wyoming*", also known as the "CHIA" (Martin, et al. 1988). This report evaluates the potential cumulative groundwater impacts of surface coal mining in the area and is incorporated by reference into this EIS. The CHIA analysis included the proposed mining of all the 1987 leases at all of the existing mines in the southern mine group. It did not evaluate potential groundwater impacts related to additional coal leasing in this area and it did not consider the potential for overlapping groundwater impacts from coal mining and CBM development.

Each mine must assess the probable hydrologic consequences of mining as part of the mine permitting process. The WDEQ/LQD must evaluate the cumulative hydrologic impacts associated with each proposed mining operation before approving the mining and reclamation plan for each mine, and they must find that the cumulative hydrologic impacts of all anticipated mining would not cause material damage to the hydrologic balance outside of the permit area for each mine. As a result of these requirements, each existing approved mining permit includes an analysis of the hydrologic impacts of the surface coal mining proposed at that mine. If revisions to mining and reclamation permits are proposed, then the potential cumulative impacts of the revisions must also be evaluated. If the Horse Creek LBA Tract is leased to the applicant, the existing mining and reclamation permit for the Antelope Mine must be revised and approved before the tract can be mined.

Additional groundwater impact analyses have also been conducted to evaluate the potential cumulative impacts of coal mining and CBM development. One example of these analyses is the report entitled A Study of Techniques to Assess Surface and Groundwater Impacts Associated with Coal Bed Methane and Surface Coal Mining, Little Thunder Creek Drainage, Wyoming (Wyoming Water Resources Center 1997). This study was prepared as part of a cooperative agreement involving WDEQ/LQD, the Wyoming State Engineer's Office, the WSGS, BLM, OSM and the University of Wyoming. The Wyodak CBM Project Draft EIS (BLM 1999) presented the results of a modeling analysis of the potential cumulative impacts of coal mining and CBM development on groundwater in the coal and overlying aquifers as a result of coal mining and CBM development. As a result of comments received on this modeling analysis, it was revised and the revised results were included in the Wyodak CBM Project Final EIS, which was distributed to the public on October 1, 1999. The technical report for both these modeling analyses are or will be available for public review at the BLM office in Buffalo, Wyoming (Applied Hydrology Associates, Inc. 1999). The results of these previously prepared analyses are incorporated by reference into this EIS.

Another source of data on the impacts of surface coal mining on groundwater is the monitoring that is required by WDEQ/LQD and administered by the mining operators. Each mine is required to monitor groundwater levels and quality in the coal and in the shallower aquifers in the area surrounding their operations. Monitoring wells are also required to record water levels and water quality in reclaimed areas.

The coal mine groundwater monitoring data is published each year by the Gillette Area Groundwater Monitoring Organization (GAGMO), a voluntary group formed in 1980. Members of GAGMO include most of the companies with operating or proposed mines in the Wyoming PRB, WDEQ, the Wyoming State Engineer's Office, BLM, USGS, and OSM. GAGMO contracts with an independent firm each year to publish the annual monitoring results. In 1991, GAGMO published a report summarizing the water monitoring data collected from 1980 to 1990 in the Wyoming PRB (Hydro-Engineering 1991b). In 1996, they published a report summarizing the data collected from 1980 to 1995 (Hydro-Engineering 1996a).

The southern group of mines uses about 1,736 ac-ft of water per year for drinking, sanitation, washing equipment, and dust control. This water comes from aquifers below the coal, from seepage into the mine pits, and from sediment- and flood-control impoundments. The five southern mines pump an estimated 1,400 ac-ft per year from the pits and dewatering wells.

Assessment of cumulative groundwater impacts in this EIS is based on impact predictions made by ACC in 1993 for dewatering at the Antelope Mine and extrapolating those drawdowns to consider mining of the Horse Creek LBA Tract, along with previous drawdown predictions made within the southern mine group that includes the Antelope Mine. Figure 4-4 depicts the predicted extent of the 5-ft drawdown contour within the coal aquifer from the various mining scenarios. The extent of the 5-ft drawdown contour is used by WDEQ/LQD to assess the cumulative extent of impact to the groundwater system caused by mining operations. In Figure 4-4, these predictions are compared to the predictions in the CHIA and monitoring information gathered since publication of the CHIA. Figure 4-4 shows only the predicted drawdowns in the coal aquifer due to mining because of the limited extent of the saturated sand aquifers in the Wasatch Formation overburden in the southern group of mines.

The major groundwater issues related to surface coal mining that have been identified by scoping are:

- the effect of the removal of the coal aquifer and any overburden aquifers within the mine area and replacement of these aquifers with spoil material;
- the extent of the temporary lowering of static water levels in the aquifers around the mine due to dewatering associated with removal of these aquifers within the mine boundaries;
- the effects of the use of water from the subcoal Fort Union Formation by the mines;
- changes in water quality as a result of mining; and

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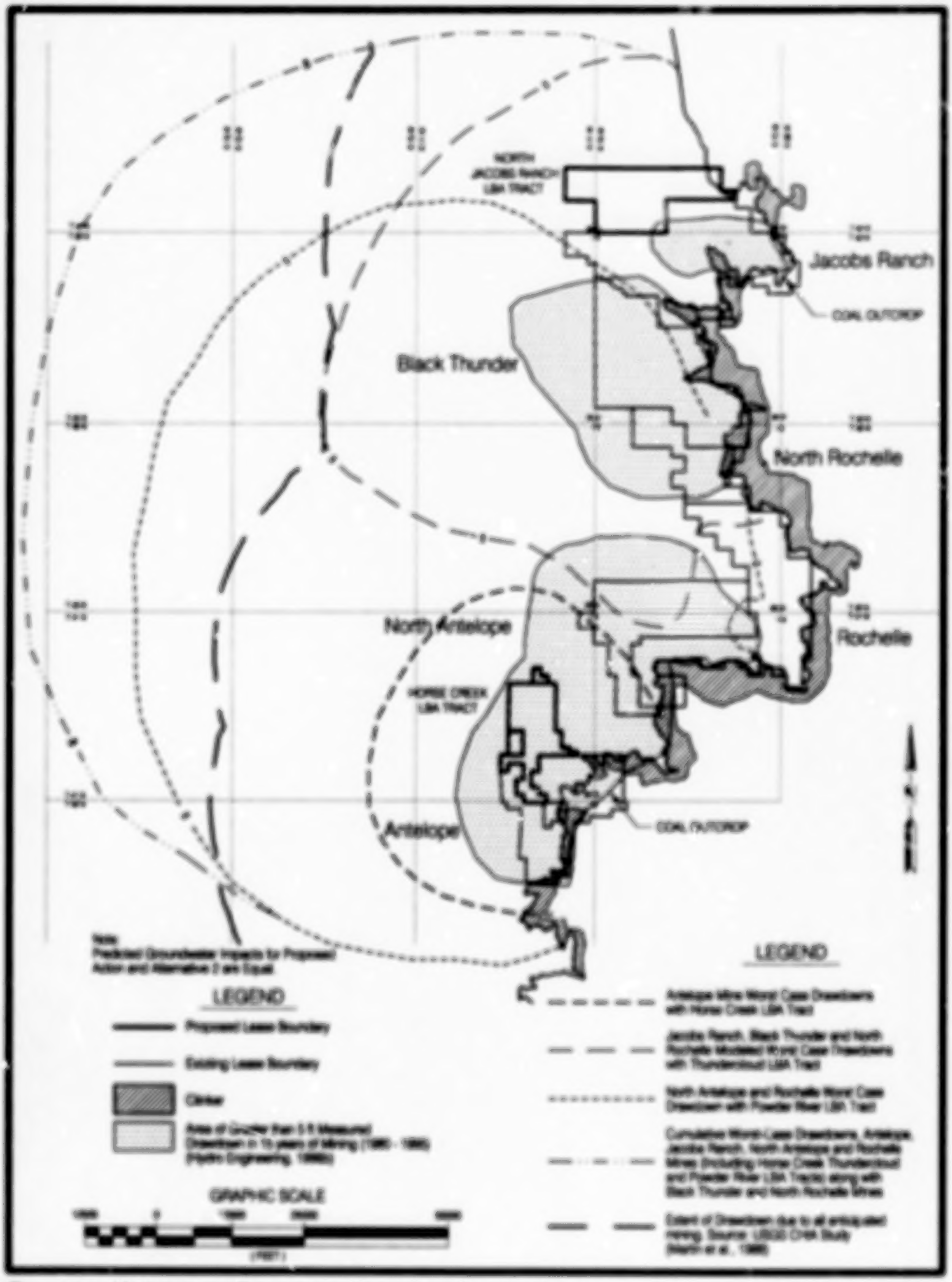
NORTH JACOBS RANCH LBA TRACT
Jacobs Ranch
COAL OUTCROP
Black Thunder
North Rochelle
North Antelope
Rochelle
HORSE CREEK LBA TRACT
Antelope
COAL OUTCROP
Note
Predicted Groundwater Impacts for Proposed Action and Alternative 2 are Equal
LEGEND
Proposed Lease Boundary
Existing Lease Boundary
Clinker
Area of Greater than 5 ft Measured Drawdown in 15 years of Mining (1980 - 1995) (Hydro Engineering, 1996)
GRAPHIC SCALE
(FEET)
LEGEND
Antelope Mine Worst Case Drawdowns with Horse Creek LBA Tract
Jacobs Ranch, Black Thunder and North Rochelle Modeled Worst Case Drawdowns with Thundercloud LBA Tract
North Antelope and Rochelle Worst Case Drawdown with Powder River LBA Tract
Cumulative Worst-Case Drawdowns, Antelope, Jacobs Ranch, North Antelope and Rochelle Mines (including Horse Creek Thundercloud and Powder River LBA Tracts) along with Black Thunder and North Rochelle Mines
Extent of Drawdown due to all anticipated mining. Source: USGS CHIA Study (Martin et al., 1988)

Figure 4-4. Modeled and Extrapolated Worst-Case Coal Aquifer Drawdown Scenarios Showing Extent of Actual 1995 Drawdowns and USGS Predicted Cumulative Drawdowns.

  - potential overlapping drawdown in the coal due to proximity of coal mining and CBM development.

The impacts of large scale surface coal mining on a cumulative basis for each of these issues are discussed in the following paragraphs.

The effects of replacing the coal aquifer and overburden with a spoils aquifer is the first major groundwater concern. The following discussion of recharge, movement, and discharge of water in the spoil aquifer is excerpted from the CHIA (Martin et al. 1988:24):

> Postmining recharge, movement and discharge of groundwater in the Wasatch aquifer and Wyodak coal aquifer will probably not be substantially different from premining conditions. Recharge rates and mechanisms will not change substantially. Hydraulic conductivity of the spoil aquifer will be approximately the same as in the Wyodak coal aquifer allowing groundwater to move from recharge areas where clinker is present east of mine areas through the spoil aquifer to the undisturbed Wasatch aquifer and Wyodak coal aquifer to the west.

GAGMO data from 1990 to 1997 verify that recharge has occurred and is continuing in the backfill (Hydro-Engineering 1991a, 1992, 1993, 1994, 1995, 1996b, 1997). The water monitoring summary reports prepared each year by GAGMO list current water levels in the monitoring wells completed in the backfill and compare them with the 1980 water levels, as estimated from the 1980 coal water-level contour maps. In the 1991 GAGMO 10-year report, some recharge had occurred in 89 percent of the backfill wells reported for that year. In the 1997 GAGMO report, 75 percent of the 62 backfill wells measured contained water. The lower percentage is due to the fact that more wells were measured in 1997, some of which were recently drilled and did not contain water.

Coal companies are required by state and federal law to mitigate any water rights that are interrupted, discontinued, or diminished by mining.

The cumulative size of the backfill area in the PRB and the duration of mining activity would be increased by mining of the recently issued leases and the currently proposed LBA tract. However, since reclamation is occurring in mined-out areas and the monitoring data demonstrate that recharge of the backfill is occurring, it is not anticipated that additional significant impacts would occur as a result of any of the pending leasing actions.

Clinker, also called scoria, the baked and fused rock formed by prehistoric burning of the Wyodak-Anderson coal seam, occurs all along the coal outcrop area (Figure 4-4) and is believed to be the major recharge source for the spoil aquifer, just as it is for the coal. However, not all clinker is saturated. Some clinker is mined for road-surfacing material, but saturated clinker is not generally mined since abundant clinker exists above the water table and does not present the mining problems that would result from mining saturated clinker. Therefore, the major recharge source for the spoil aquifer is not being disturbed by current mining. Clinker does not occur in significant amounts on the LBA tract being considered in this EIS.

The second major groundwater issue is the extent of water level drawdown in the coal and shallower aquifers in the area surrounding the mines. Most of the monitoring wells included in the GAGMO 15-year report (542 wells out of 600 total) are completed in the coal beds, in the overlying sediments, or in sand channels or interburden between the coal beds. The changes in water levels in the coal seams after 15 years of monitoring are shown on Figure 4-4, which was adapted from the 1996 GAGMO 15-year report (Hydro Engineering 1996a). This map shows the area where actual drawdown in the coal seam has been greater than 5 ft in 15 years, in comparison with the predicted worst-case 5-ft drawdown derived from groundwater modeling done by the mines. WDEQ/LQD policy is to have the mining companies determine the extent of the 5-ft drawdown contour as a method of determining off-site impacts from the various mining operations.

Figure 4-4 indicates that the drawdowns observed in 15 years of mining are still well within the total cumulative drawdown predicted in the CHIA. Adding the predictions for the Horse Creek, Thundercloud and Powder River LBA Tracts to existing drawdown predictions prepared for the Black Thunder and North Rochelle Mines extends the predicted cumulative extent of the 5-ft drawdown about 9.5 miles past the cumulative drawdown prediction in the 1988 CHIA.

The CHIA predicted the approximate area of 5 ft or more water level decline in the Wyodak coal aquifer which would result from "all anticipated coal mining". "All anticipated coal mining" at that time included 16 surface coal mines operating at the time the report was prepared and six additional mines proposed at that time. All of the currently producing mines, including the Antelope Mine, were considered in the CHIA analysis (Martin et al. 1988). The study predicted that water supply wells completed in the coal may be affected as far away as eight miles from mine pits, although the effects at that distance were predicted to be minimal.

As drawdowns propagate to the west, available drawdown in the coal aquifer increases. Available drawdown is defined as the elevation difference between the potentiometric surface (elevation to which water will rise in a well bore) and the bottom of the aquifer. Proceeding west, the coal depth increases faster than the potentiometric surface declines, so available drawdown in the coal increases. Since the depth to coal increases, most stock and domestic wells are completed in units above the coal. Consequently, with the exception of methane wells, few wells are completed in the coal in the areas west of the mines. Those wells completed in the coal have considerable available drawdown, so adverse impacts to wells outside the immediate mine area are unlikely.

Wells in the Wasatch Formation were predicted to be impacted by drawdown only if they were within 2,000 ft of a mine pit (Martin et al. 1988). Drawdowns occur farther from the mine pits in the coal than in the shallower aquifers because the coal is a confined aquifer that is areally extensive. The area in which the shallower aquifers (Wasatch Formation, alluvium, and clinker) experience a 5-ft drawdown would be much smaller than the area of drawdown in the coal because the shallower aquifers are generally discontinuous, of limited areal extent, and may be confined or unconfined.

Since the actual 1995 drawdown lies within the cumulative drawdown predicted by the CHIA study, the cumulative impacts to water wells have not reached the maximum levels predicted in that report. Of the 1,200 water supply wells within the maximum impact area defined in the CHIA study, about 580 are completed in Wasatch aquifers, about 100 in the Wyodak coal aquifer, and about 280 in strata below the coal. There are no completion data available for the remainder of these wells (about 240).

The additional groundwater impacts that would be expected as a result of extending mining into the LBA's issued or proposed to date would be to extend the drawdown into areas surrounding the proposed new leases. The predicted cumulative effects of mining the LBA tract are depicted on Figure 4-4. Currently, the actual drawdown in the coal aquifer in the vicinity of Black Thunder and Jacobs Ranch mines is expressed in two separate cones of depression; drawdowns in the vicinity of the Antelope and North Antelope/Rochelle mines have coalesced. These cumulative drawdowns would be increased by mining the Horse Creek LBA Tract, which is located between Antelope and North Antelope.

Prior to amending the LBA tract into its existing WDEQ mine permit, the applicant (ACC) would either be required to conduct more detailed groundwater modeling to predict the extent of drawdown in the coal and overburden aquifers caused by mining the LBA tract or use the drawdown predictions in the pending CHIA. The applicant has installed monitoring wells which would be used to confirm or refute drawdowns predicted by modeling. This modeling would be required as part of the WDEQ mine permitting procedure discussed in Section 1.2.

Withdrawal of water for the ENCOAL facility would lower water levels in the scoria aquifer to the east of the North Rochelle Mine if the rate of withdrawal exceeds recharge (currently unknown). As discussed above, the scoria provides the primary source of recharge to the Wyodak coal aquifer. As mining at the North Rochelle Mine continues, the coal will be removed and replaced with spoil, which would be expected to have the same conductivity as the Wyodak coal aquifer according to

Martin, et al. (1988 p. 24). The primary impact due to lowering water levels in the scoria would be a potential delay in the recovery of water levels in the North Rochelle Mine backfill, as the rate at which the backfill would receive recharge from the scoria would be related to the scoria water levels. Based on the size of the scoria aquifer supplying ENCOAL and the amount of water to be withdrawn from it, complete recovery of the scoria water levels could take up to 100 years, slowing recovery of North Rochelle Mine spoil water levels for an equal duration. Since predictions for recovery of water levels in the spoils range from tens to thousands of years, the additional delay in recovery caused by the ENCOAL water supply wells is within the range of predictions.

The proposed Two Elk project, if constructed, would also add to cumulative impacts. Currently, water demands for the Two Elk project have not been finalized. The likely source of supply for the Two Elk project will be the Lance-Fox Hills Aquifer.

Potential water-level decline in the subcoal Fort Union Formation is the third major groundwater issue. According to the Wyoming State Engineer's records as of July 1999, 14 mines hold permits for 42 wells between 400 ft and 10,000 ft deep. The zone of completion of these wells was not specified, and not all of the wells were producing (for example, three of the permits were held by an inactive mine, and one of the wells permitted by the Black Thunder Mine has not been used since 1984).

Water level declines in the Tullock Aquifer have been documented in the Gillette area. According to Crist (1991), these declines are most likely attributable to pumpage for municipal use by Gillette and for use at subdivisions and trailer parks in and near the city of Gillette. Most of the water-level declines in the subcoal Fort Union wells occur within one mile of the pumped wells (Crist 1991; Martin et al. 1988). The mine facilities in the PRB are separated by a distance of one mile or more, so little interference between mine supply wells would be expected.

In response to concerns voiced by regulatory personnel, several mines have conducted impact studies of the subcoal Fort Union Formation. The OSM commissioned a cumulative impact study of the subcoal Fort Union Formation to study the effects of mine facility wells on this aquifer unit (OSM 1984). Conclusions from all these studies are similar and may be summarized as follows:

- Because of the discontinuous nature of the sands in this formation and because most large-yield wells are completed in several different sands, it is difficult to correlate completion intervals between wells.

- In the Gillette area, water levels in this aquifer are probably declining because the city of Gillette and several subdivisions are utilizing water from the formation (Crist 1991). (Note: Gillette is using this water as a back-up source at this time.)

- Because large saturated thicknesses are available in this aquifer unit, generally 500 ft or more, a drawdown of 100 to 200 ft in the vicinity of a pumped well would not dewater the aquifer.

The Antelope Mine adjacent to the Horse Creek LBA Tract has a permit from the State Engineer for a deeper Ft. Union Formation water supply well. Extending the life of the mine with the LBA would result in additional water being withdrawn from the Tullock Aquifer. The additional water withdrawal would not be expected to extend the area of water level drawdown over a significantly larger area due to the discontinuous nature of the sands in the Tullock Aquifer and the fact that drawdown and yield reach equilibrium in a well due to recharge effects.

The nearest sub-coal Fort Union well to the Antelope Mine facilities is over 5 miles away, at the North Antelope/Rochelle Complex. Due to the distance involved, these wells have not experienced interference and are not likely to in the future. The Antelope Mine well will be in use for 8 to 9 more years due to Horse Creek LBA Tract, and its annual water production will increase, though not directly in proportion to coal production, which is scheduled to increase by 50%.

According to the Wyoming SEO, the only permitted wells drilled below 1,000 ft in a 100 mi^2 area surrounding Wright are four wells permitted by the City of Wright. As discussed above, most of the water-level declines in the subcoal Fort Union wells occur within one mile of pumped wells. The Horse Creek LBA Tract, about 17 miles southeast of Wright, would not contribute significantly to any cumulative impact on the water supply for that town under the action alternatives because no new wells would be required to maintain existing production.

Water requirements and sources for the proposed Two Elk project are not currently known. The State Engineer is discouraging further development of the lower Fort Union aquifers, so the most likely source for Two Elk is the Lance-Fox Hills. This will reduce the chances that Two Elk will add to cumulative hydrologic impacts of mining.

The fourth issue of concern with groundwater is the effect of mining on water quality. Specifically, what effect does mining have on the water quality in the surrounding area, and what are the potential water quality problems in the spoil aquifer following mining?

In a regional study of the cumulative impacts of coal mining, the median concentrations of dissolved solids and sulfates were found to be larger in water from spoil aquifers than in water from either the Wasatch overburden or the coal aquifer (Martin et al. 1988). This is expected because blasting and movement of the overburden materials exposes more surface area to water, increasing dissolution of soluble materials, particularly when the overburden materials were situated above the saturated zone in the premining environment. On the basis of studies done in North Dakota, it was estimated that at least one pore volume of water must leach the spoil before the dissolved solids concentration in the water would be similar to the premining dissolved solids concentration (Houghton et al. 1987). One pore volume of water is the volume of water which would be required to saturate the spoils following reclamation. The time required for one pore volume of water to pass through the spoil aquifer is greater than the time required for the postmining groundwater system to re-establish equilibrium. According to the CHIA, estimates of the time required to re-establish equilibrium range from tens to hundreds of years (Martin et al. 1988).

Chemical analyses of 336 samples collected between 1981 and 1986 from 45 wells completed in spoil aquifers at ten mines indicated that the quality of water in the spoil will, in general, meet state standards for livestock use when recharge occurs (Martin et al. 1988). The major current use of water from the aquifers being replaced by the spoils (the Wasatch and Wyodak Coal aquifers) is for livestock because these aquifers are typically high in dissolved solids in their premining state (Martin et al. 1988).

According to monitoring data published by GAGMO (Hydro-Engineering 1991a, 1991b, 1992, 1993, 1994, 1995, 1996b, 1997), TDS values in backfill wells have ranged from 400 to 25,000 mg/L. Of the 34 backfill wells measured in 1996 and reported in the 1997 annual GAGMO report (Hydro Engineering 1997), TDS in 71 percent were less than 5,000 mg/L, TDS in 27 percent were between 5,000 and 10,000 mg/L, and TDS in two percent were above 10,000 mg/L. These data support the conclusion that water from the spoils will generally be acceptable for its current use, which is livestock watering, before and after equilibrium is established. The incremental effect on groundwater quality due to leasing and mining of the LBA tract would be to increase the total volume of spoil and, thus, the time for equilibrium to re-establish.

The fifth area of concern is the potential for cumulative impacts to groundwater resources in the coal due to the proximity of coal mining and CBM development. The Wyodak coal is being developed for both coal and CBM in the same general area. Dewatering activities associated with reasonably foreseeable CBM development would be expected to overlap with and expand the area of groundwater drawdown in the coal aquifer in the PRB over what would occur due to coal mining alone.

Numerical groundwater flow modeling was used to predict the drawdown impacts of the Wyodak CBM Project (BLM 1999). The modeling considered coal mining and CBM development in order to assess cumulative impacts. Modeling was done to simulate mining with and without CBM development in order to differentiate the impacts of the two types of activities.

As expected, modeling showed that the additional groundwater impacts that would result from CBM development would be additive in nature and would extend the area experiencing a loss in hydraulic head to the west of the mining area. The area between the CBM fields and the mines would be subjected to cumulative impacts of the two activities. The 15-year GAGMO report points out that there are already areas of overlapping impacts between the Marquiss and Lighthouse CBM projects and the Caballo, Belle Ayr and Cordero-Rojo mines (Hydro-Engineering 1996a).

Figure 4-5 shows the Antelope Mine life of mine drawdown map (same as Figure 4-2) with the maximum modeled drawdowns from the Wyodak CBM DEIS superimposed. These modeled drawdowns are for CBM only in the upper Wyodak Coal and are for the proposed action of 3,000 CBM wells (BLM 1999). The water modeling study done for the Wyodak CBM Draft and Final EISs considered the impacts of coal mining and CBM development on groundwater in the coal and overlying aquifers in the area shown in Figure 1-1 using the existing coal mines and predicted CBM well locations based on discussions with CBM. The model did not project any potential CBM drilling in the area of the Antelope Mine. The closest projected CBM well "pod" under the Proposed Action analyzed in that modeling analysis was located in T. 42 N., R. 72 W., approximately five miles northeast of the Horse Creek LBA Tract. Figure 4-5 shows that the projected drawdown in the coal caused by mining at the Antelope Mine would be expected to overlap with projected drawdown due to CBM production. To the north and west of the Antelope Mine, the projected drawdown in the coal aquifer due to CBM production would exceed drawdown due to mining. In close proximity to the mine, projected drawdown due to mining would exceed drawdown due to CBM production. Drawdowns from CBM development would be projected to exceed drawdowns from coal mining at a distance of approximately one mile from the mine.

Drawdowns in the coal caused by CBM development would be expected to reduce the need for dewatering in advance of mining, which would be beneficial for mining. Wells completed in the coal may also experience increased methane emissions in areas of significant aquifer depressurization. There would be a potential for conflicts to occur over who (coal mining or CBM operators) is responsible for replacing or repairing private wells that are adversely affected by the drawdowns; however, the number of potentially affected wells completed in the coal is not large.

As discussed previously, coal companies are required by state and federal law to mitigate any water rights that are interrupted, discontinued, or diminished by coal mining. In response to concerns about the potential impacts of CBM development on water rights, a group of CBM operators and local landowners developed a standard water well monitoring and mitigation agreement that can be used on a case-by-case basis as development proceeds. The BLM decision record for the Gillette South Coal Bed Methane Project EIS (BLM 1997) requires that CBM operators offer landowners this agreement as part of the federal well approval process.

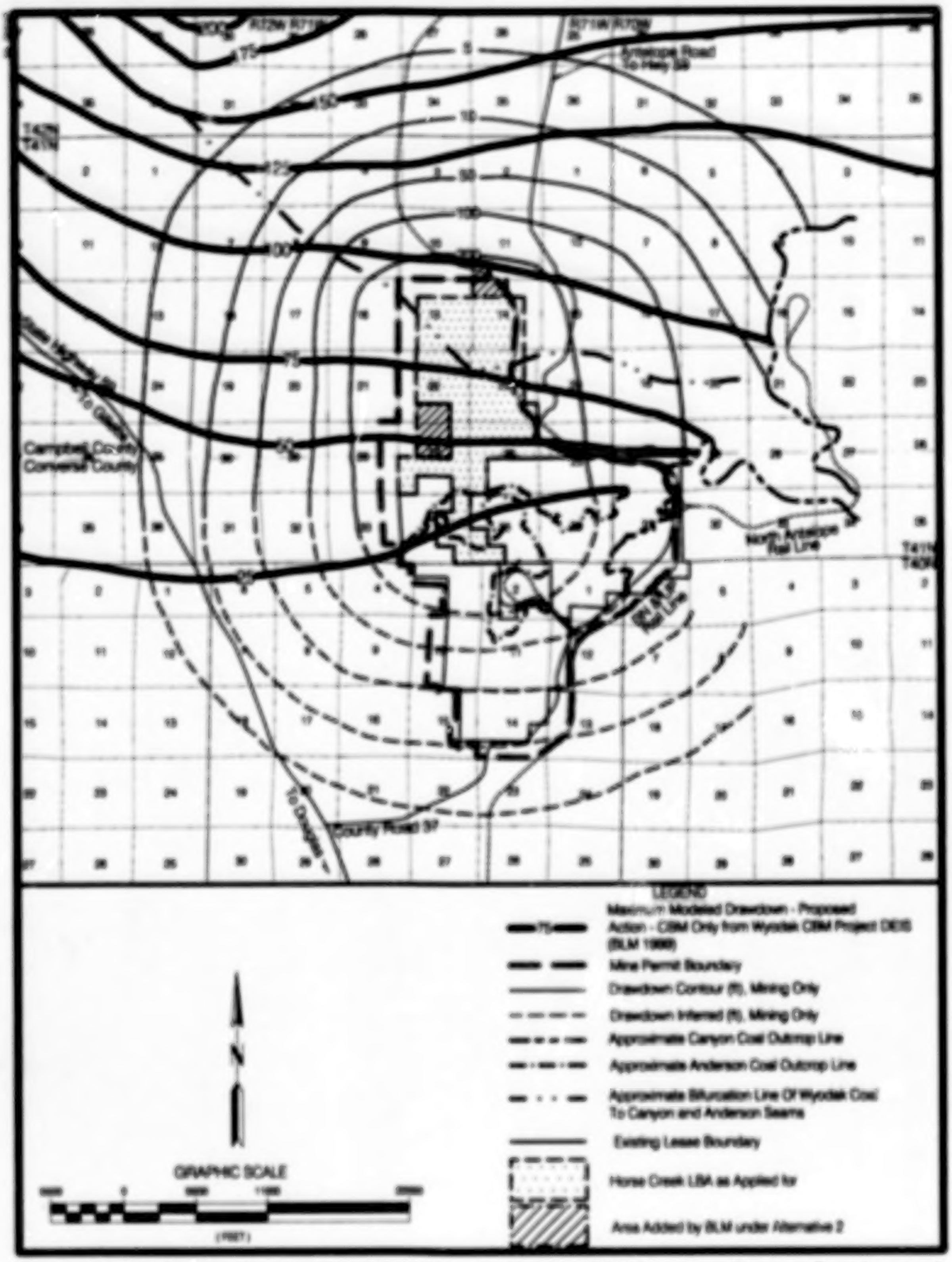
200
R72W R71W
175
5
R71W R70W
Antelope Road
To Hwy 59
150
10
T42N
T41N
125
50
100
100
State Highway 59
To Gillette
75
Campbell County
Converse County
50
25
North Antelope Rail Line
T41N
T40N
To Douglas
County Road 37
LEGEND
Maximum Modeled Drawdown - Proposed Action - CBM Only from Wyodak CBM Project DEIS (BLM 1999)
Mine Permit Boundary
Drawdown Contour (ft), Mining Only
Drawdown Inferred (ft), Mining Only
Approximate Canyon Coal Outcrop Line
Approximate Anderson Coal Outcrop Line
Approximate Bifurcation Line Of Wyodak Coal To Canyon and Anderson Seams
Existing Lease Boundary
Horse Creek LBA as Applied for
Area Added by BLM under Alternative 2
N
GRAPHIC SCALE
(FEET)

Figure 4-5. Life Of Mine Drawdown Map With Maximum Modeled CBM Drawdown Contours Superimposed.

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BLM and industry have cooperated to develop a system of monitoring wells designed to monitor groundwater levels in the coal and in shallower aquifers in areas of CBM production. In the future, the CBM operators will be responsible for drilling and maintaining additional monitoring wells as the area of CBM development expands. The CBM operators are forming an organization similar to GAGMO to publish CBM monitoring data.

The increased dewatering or depressuring of the coal seam caused by CBM development and mining together will also increase the time required for water-level recovery to occur after the CBM and mining projects are completed.

4.5.6 Alluvial Valley Floors

No cumulative impacts to alluvial valley floors are expected to occur as a result of leasing and subsequent mining of the Horse Creek LBA Tract. Impacts to designated AVF's are generally not permitted if the AVF is determined to be significant to agriculture. AVF's that are not significant to agriculture can be disturbed during mining but they must be restored as part of the reclamation process. Impacts during mining, before the AVF is restored, would be expected to be incremental, not additive.

4.5.7 Wetlands

Wetlands are discrete features that are delineated on the basis of specific soil, vegetation, and hydrologic characteristics. Wetlands within areas of coal mining disturbance are impacted; wetlands outside the area of disturbance are generally not affected unless their drainage areas (hence, water supplies) are changed by mining. Therefore, the impacts to wetlands as a result of surface coal mining are mostly incremental, not additive as are impacts to groundwater and air quality. Increasing the area to be mined would increase the number of wetlands that would be impacted.

Antelope Mine has been authorized to impact 32.7 acres of jurisdictional wetlands. This number would increase if the LBA tract is leased (see Section 3.8). Existing wetlands along Antelope Creek would not be disturbed by mining the existing Antelope leases or the Horse Creek LBA Tract.

COE requires replacement of all impacted jurisdictional wetlands in accordance with Section 404 of the Clean Water Act. Replacement of functional wetlands may occur in accordance with agreements with the private landowners; no federal surface lands are included in the Horse Creek LBA Tract. During mining and before replacement of wetlands, all wetland functions would be lost. The replaced wetlands may not function in the same way as the premine wetlands did.

4.5.8 Vegetation

Most of the land that is being or would be disturbed is grassland, sagebrush shrubland or breaks grassland and is used for grazing and wildlife habitat. Rangeland is, by far, the predominant land use in the PRB, comprising 92 percent of the land use in Converse and Campbell Counties. A small amount of previously cultivated lands would be disrupted by mining. At the completion of mining, it is anticipated that all disturbed land would be reclaimed for grazing and wildlife habitat, mostly in the form of mixed native grass prairie, sagebrush shrubland and, where appropriate, bottomland grassland. Some of the minor community types, such as those occurring on breaks, would not be restored to premining conditions but may be replaced to a higher level due to use of better quality soils.

Based on annual reports prepared by mining companies and submitted to WDEQ, in any given year approximately 10,000 acres of land disturbed by mining activities at the five existing southern surface coal mines would not be reclaimed to the point of planting with permanent seed mixtures. Over the life of the five southern mines, a total of about 49,000 acres would be disturbed. This disturbed area includes all leases existing including federal, state and private coal. The currently proposed Horse Creek and North Jacobs Ranch LBAs would add another 7,000 acres. Almost all of this acreage is native rangeland and would be returned to a native rangeland state through planting of approved revegetation seed mixtures as required.

Several impacts to vegetation would occur as a result of operations at these five mines. Most of the surface disturbance would occur in two vegetation types: mixed grass prairie (25 percent) and Wyoming big sagebrush (40 percent). The big sagebrush vegetation type comprises eight percent of the Horse Creek LBA Tract area, somewhat less than the percentage for the five-mine southern cluster. Upland grassland comprises 51 percent of the disturbance area of the tract. All five mines plan to restore these two types as required by law. It is estimated that it would take from 20 to 100 years for big sagebrush density to reach premining levels. The big sagebrush component provides important wildlife habitat (particularly for mule deer, pronghorn, and sage grouse). The reduction in acreage of big sagebrush vegetation type would, therefore, reduce the carrying capacity of the reclaimed lands for pronghorn and sage grouse populations. Mule deer should not be affected since they are not as abundant in this area.

Although some of the less extensive native vegetation types (e.g., graminoid/forb ephemeral drainages) would be restored during reclamation, the treated grazing lands would not. Following reclamation and release of the reclamation bond, however, privately owned surface lands would be returned to agricultural management and the areas with re-established native vegetation could again be subject to sagebrush management practices. Consequently, community and species diversities would initially be lower on reclaimed lands. The shrub components would take the longest to be restored to premining conditions. Shrub cover and forage values would gradually increase in the years following reclamation. Over longer periods of time, species re-invasion and shrub establishment on reclaimed lands should largely restore the species and community diversity on these lands to premining levels.

Over the long term, the net effect of the cumulative mine reclamation plans may be the restoration, at least in part, of all vegetation types originally found in the area. However, the shrub component may be substantially reduced in areal extent. Shrubs are relatively unproductive for livestock but very important for wildlife. All of the vegetation types found in the cumulative analysis area, as on the LBA tract, are fairly typical for this region of eastern Wyoming.

4.5.9 Wildlife

The direct impacts of surface coal mining on wildlife occur during mining and are therefore short-term. They include road kills by mine-related traffic, restrictions on wildlife movement created by fences, spoil piles and pits, and displacement of wildlife from active mining areas. The indirect impacts are longer term and include loss of carrying capacity and microhabitats on reclaimed land due to flatter topography, less diverse vegetative cover, and reduction in sagebrush density.

After mining and reclamation, alterations in the topography and vegetative cover, particularly the reduction in sagebrush density, would cause a decrease in carrying capacity and diversity on the LBA tract. Sagebrush would gradually become reestablished on the reclaimed land, but the topographic changes would be permanent.

Cumulative impacts to most wildlife would increase as additional habitat is disturbed but would moderate as more land is reclaimed. Raptor and grouse breeding areas have been diminishing statewide for at least the last 30 years due, in part, to surface-disturbing activities. Coal mining and gas exploration and development have been identified as potential contributors to the decline in their breeding habitat. Therefore, surface occupancy and disturbance restrictions, as well as seasonal restriction stipulations, have been applied to operations occurring on or near these crucial areas on public lands. Because of the split mineral estate that exists in the PRB, yearlong prohibitions on surface occupancy and restrictions on activities near areas critical to grouse have not proven successful. These restrictions and stipulations have helped to protect important raptor and grouse habitat on public lands. Erection of nesting structures and planting of trees on reclaimed land will gradually replace raptor nesting and perching sites. There is little crucial habitat for waterfowl or fish on the mine sites. Small- and medium-sized animals will rapidly move back into the areas once reclamation is completed.

Numerous grazing management projects (fencing, reservoir development, spring development, well construction, vegetative treatments) have also impacted wildlife habitat in the area. The consequences of these developments have proven beneficial to some species and detrimental to others. Fencing has aided in segregation and distribution of livestock grazing, but sheep-tight woven wire fence has restricted pronghorn movement. Water developments are used by wildlife; however, without proper livestock management, many of these areas can become overgrazed. The developed reservoirs provide waterfowl, fish, and amphibian habitat. Vegetation manipulations have included the removal or reduction of native grass-shrublands and replacement with cultivated crops (mainly alfalfa/grass hay), as well as a general reduction of shrubs (mainly sagebrush) in favor of grass. These changes have increased spring and summer habitat for grazing animals, but have also reduced the important shrub component that is critical for winter range, thus reducing overwinter survival for big game and sage grouse. The reduction in sagebrush has been directly blamed for the downward trend in the sage grouse populations.

Significant cumulative impacts to pronghorn resulting from existing concentrated mining and related disturbance were predicted in the regional EIS's (BLM 1974, 1979, 1981, and 1984b) as a result of habitat disturbance and creation of barriers to seasonal and daily movements. Significant cumulative indirect impacts were also predicted because of increased human population and access resulting in more poaching, increased vehicle/pronghorn collisions, and increased disturbance in general. Leasing of the Horse Creek LBA Tract would increase the area of habitat disturbance in the southern group of mines by approximately six percent and would enlarge the area where daily movement is restricted.

The Horse Creek LBA Tract is within the Lance Creek Pronghorn Herd Unit, which includes about 2.8 million acres. The mining operations within the Lance Creek Herd Unit are the Black Thunder, North Rochelle, North Antelope/Rochelle, and Antelope Mines. These mines will cumulatively disturb approximately 37,000 acres based on existing leases (includes estimated disturbance for the recently leased North Rochelle, Powder River and Thundercloud LBA tracts, which are not yet permitted). If the Horse Creek LBA Tract is leased, the estimated mining disturbance within the Lance Creek Herd Unit would increase by up to 3,581 acres to about 40,580 acres. This would represent approximately 1.4 percent of the Lance Creek Herd Unit area.

The Horse Creek LBA Tract is located within both the Thunder Basin and Lance Creek Mule Deer Herd Units. The two herd units contain approximately four million acres and include 11 permitted coal mines along Highway 59. The northern-most is Caballo and the southern-most is Antelope. Currently permitted disturbance within this 9-mine group includes approximately 76,760 acres. Addition of the Horse Creek LBA Tract would increase the disturbance area by up to 3,581 acres, an increase of five percent. The recently issued Thundercloud and Powder River LBA Tracts, with a combined proposed disturbed area of as much as 8,503 acres, are also within these two mule deer herd units. Adding the Horse Creek, Thundercloud and Powder River tracts to the area to be disturbed within the Thunder Basin and Lance Creek Mule Deer Herd

Units would increase disturbance by 12,084 acres, bringing the total disturbance up to 88,844 acres or 2.2 percent of the total area.

There is little use of the LBA tract by other big game species (elk, and white-tailed deer).

The area of active mining in the southern group of mines contains significant numbers of raptor nests. The largest concentration of nesting activity in the area is associated with the rough breaks country and areas where trees have become established. Raptor mitigation plans are included in the approved mining and reclamation plans of each mine. The raptor mitigation plan for each mine is subject to USFWS review and approval before the mining and reclamation plan is approved. Any nests that are impacted by mining operations must be relocated in accordance with these plans, after special use permits are secured from USFWS and WGFD. The creation of artificial raptor nest sites and raptor perches may ultimately enhance raptor populations in the mined area. On the other hand, where power poles border roads, perched raptors may continue to be illegally shot and continued road kills of scavenging eagles may occur. Any influx of people into previously undisturbed land may also result in increased disturbance of nesting and fledgling raptors.

Cumulative impacts to waterfowl from already-approved mining, as well as the proposed LBA tract, would be insignificant because most of these birds are transient and most of the ponds are ephemeral. In addition, the more permanent impoundments and reservoirs that are impacted by mining would be restored. Sedimentation ponds and wetland mitigation sites would provide areas for waterfowl during mining.

Direct habitat disturbance from already-approved mining, as well as the LBA tract, should not significantly affect regional sage grouse populations because few vital sage grouse wintering areas or leks have been, or are planned to be, disturbed. However, noise related to the mining activity could indirectly impact sage grouse reproductive success. Sage grouse leks close to active mining could be abandoned if mining-related noise elevates the existing ambient noise levels. Surface coal mining activity is known to contribute to a drop in male sage grouse attendance at leks close to active mining, and over time this can alter the distribution of breeding grouse (Remington and Braun 1991). Because sage grouse populations throughout Wyoming have been declining over the past several years, this impact could be significant to the local population when evaluated with the cumulative impacts of all energy-related development occurring in the area.

The existing and proposed mines in the southern PRB would cumulatively cause a reduction in habitat for other mammal and bird species. Many of these species are highly mobile, have access to adjacent habitats, and possess a high reproductive potential. As a result, these species should respond quickly and invade suitable reclaimed lands as reclamation proceeds.

Cumulative impacts on fish habitat and populations would be minimal because local drainages generally have limited value due to intermittent or ephemeral flows. Some of the permanent pools along drainages support minnows and other nongame fish, and the larger impoundments and streams in the area which have fish populations would be restored following mining.

Additional discussions of cumulative impacts to wildlife from coal development and industrialization of the eastern PRB are discussed in BLM regional EIS's for the area (BLM 1974, 1979, 1981, 1984b), and these documents are incorporated by reference into this EIS. The impacts predicted in these documents have generally not been exceeded.

4.5.10 Threatened, Endangered, and Candidate Species

The USFWS has evaluated potential impacts to T&E species on the existing permit areas and has, in general, determined that no adverse impacts would occur to protected species.

OSM (1982) prepared a biological assessment of the eastern PRB in 1982 which concluded that mining operations might affect bald eagles. Following requirements of the Endangered Species Act, OSM requested a biological opinion from the USFWS, which was expanded to include a commentary on black-footed ferrets and peregrine falcons. The opinion stated that cumulative impacts would not be adverse for bald eagles or peregrines but might be adverse for ferrets. As a result, OSM requires ferret surveys within one year of surface disturbance, either as a commitment in the mine plan or as a permit stipulation. USFWS requirements also mandate surveys for Ute Ladies-tresses and mountain plovers in potential habitat prior to surface-disturbing activities. The swift fox is another candidate species that has potential habitat in the PRB. This species has not been recently recorded in the area and should not be impacted. Any potential impacts to T&E species would be mitigated as required. Thus, no significant cumulative impacts to T&E species are projected, with or without leasing of the LBA tract.

4.5.11 Land Use and Recreation

In addition to reducing livestock grazing and wildlife habitat, surface coal mining also disrupts oil and gas development and limits access to public lands.

Cumulative impacts resulting from energy extraction in the PRB include a reduction of livestock grazing and subsequent revenues, a reduction in habitat for some species of wildlife (particularly pronghorn and mule deer), and loss of recreational access to public lands (particularly for hunters).

There are no recreation facilities, wilderness areas, etc., in the immediate vicinity of the existing southern group of mines, and the majority of the land is seldom used by the public except for dispersed recreation (e.g., hunting), off-road vehicles, and sightseeing. Hunting and other public access is generally limited inside of the mine permit areas for safety reasons. However, approximately 80 percent of this land surface is private and access is controlled by the landowner. Leasing the Horse Creek LBA Tract would not affect access to public lands because no public lands are included on the tract.

The increased human presence associated with the cumulative energy development in the PRB has likely increased levels of legal and illegal hunting. Conversely, the mines in the area have become refuges for big game animals during hunting seasons since they are often closed to hunting. Reclaimed areas are attractive forage areas for big game. As an example, reclaimed lands at the Jacobs Ranch Mine have been declared crucial elk winter habitat by WGFD (Oedekoven 1994). Energy development-related indirect impacts to wildlife have and will continue to result from human population growth. Energy development has been the primary cause of human influx into the eastern PRB. Mining the LBA tract will support an increase in employment levels as coal production increases and will increase the years of production at the existing mine. The demand for outdoor recreational activities, including hunting and fishing, has increased proportionately. However, at the same time these demands are increasing, wildlife habitat and populations are being reduced. This conflict between decreased habitat availability and increased recreational demand has had (or may have) several impacts: demand for hunting licenses may increase to the point that a lower success in drawing particular licenses will occur; hunting and fishing, in general, may become less enjoyable due to more limited success and overcrowding; poaching may increase; the increase in people and traffic has and may continue to result in shooting of nongame species and road kills; and increased off-road activities have and will continue to result in disturbance of wildlife during sensitive wintering or reproductive periods.

Campbell County's public recreation facilities are some of the most extensively developed in the Rocky Mountain Region, and use by young, recreation-oriented residents is high. The relatively strong financial position of the county recreation program appears to assure future recreation opportunities for residents regardless of the development of the LBA tract or any other specific mine. Converse County's recreational facilities are not as advanced, and development of the LBA tract and the ensuing employment increase may increase demand for recreational opportunities in Converse County.

4.5.12 Cultural Resources

In most cases, treatment of eligible sites is confined to those that would be directly impacted, while those that may be indirectly impacted receive little or no consideration unless a direct mine-associated effect can be established. The higher population levels associated with coal development coupled with increased access to remote areas can result in increased vandalism both on and off mine property. Development of lands in which coal is strip-mineable (shallow overburden) may contribute to the permanent unintentional destruction of segments of the archeological record.

A majority of the known cultural resource sites in the PRB are known because of studies at existing and proposed coal mines. An average density estimate of 8.5 sites per mi^2 (640 acres) can be made based on inventories at existing mines in the area, and approximately 25 percent of these sites are typically eligible for the NRHP. Approximately 550 cultural resource sites will be impacted by already-approved mines, with an estimated 140 of these sites being eligible for nomination to the NRHP. Clearly, a number of significant sites, or sites eligible for nomination to the NRHP, have been or will be impacted by coal mining operations within the PRB. Ground disturbance, the major impact, can affect the integrity of or destroy a site. Changes in setting or context greatly impact historical properties. Mitigation measures such as stabilization, restoration, or moving of buildings may cause adverse impacts to context, in-place values, and overall integrity. Additionally, loss of sites through mitigation can constitute an adverse impact by eliminating the site from the regional database and/or affecting its future research potential.

Beneficial results or impacts can also occur from coal development. Valuable data are collected during cultural resource surveys. Data that would otherwise not be collected until some time in the future, or lost in the interim, are made available for study. Mitigation also results in the collection and preservation of data that would otherwise be lost. The data that has been and will be collected provided opportunities for regional and local archeological research projects.

4.5.13 Native American Concerns

No cumulative impacts to Native American traditional values or religious sites have been identified as a result of leasing and subsequent mining of the Horse Creek LBA Tract.

4.5.14 Paleontological Resources

Impacts to paleontological resources as a result of the already-approved cumulative energy development occurring in the PRB consist of losses of plant, invertebrate, and vertebrate fossil material for scientific research, public education (interpretive programs), and other values. Losses have and will result from the destruction, disturbance, or removal of fossil materials as a result of surface-disturbing activities, as well as unauthorized collection and vandalism. A beneficial impact of surface mining can be the exposure of fossil materials for scientific examination and collection, which might never occur except as a result of overburden removal, exposure of rock strata, and mineral excavation.

4.5.15 Visual Resources

A principal visual impact in this area is the visibility of mine pits and facility areas. People most likely to see these facilities would either be passing through the area or visiting it on mine-related business. Except for the loading facilities and the draglines, the pits and facilities are not visible from more than a few miles away. No new facilities would be required to mine the LBA tract as an extension of the existing Antelope Mine. Issuance of the LBA tract would not change this impact.

After mining, the reclaimed slopes might appear somewhat smoother than premining slopes and there would be fewer gullies than at present. Even so, the landscape of the reclaimed mine would look very much like undisturbed landscape in the area.

4.5.16 Noise

Existing land uses within the PRB (e.g., mining, livestock grazing, oil and gas production, transportation, and recreation) contribute to noise levels, but wind is generally the primary noise source. Mining on the LBA tract would not increase the number of noise-producing facilities within the PRB, but it would lengthen the time this particular noise source would exist and may augment the level of impacts to other resources (e.g., increased exposure of wildlife to noise impact, increased noise impacts to recreational users). Mining-related noise is generally masked by the wind at short distances, so cumulative overlap of noise impacts between mines is not likely.

Recreational users and grazing lessees utilizing lands surrounding active mining areas do hear mining-related noise; but this has not been reported to cause a significant impact. As stated above, wildlife in the immediate vicinity of mining may be adversely affected by noise; however, observations at other surface coal mines in the area indicate that wildlife generally adapt to noise conditions associated with active coal mining.

Cumulative increases in noise from trains serving the PRB mines have caused substantial increases (more than five dBA) in noise levels along segments of the rail lines over which the coal is transported to markets. However, no significant adverse impacts have been reported as a result.

4.5.17 Transportation Facilities

New or enhanced transportation facilities (road, railroads, and pipelines) are expected to occur as a result of energy development in the Powder River Basin. However, no new cumulative impacts to transportation facilities are expected to occur as a direct result of leasing and subsequent mining of the Horse Creek LBA Tract. The transportation facilities for the Antelope Mine are already in place. Acquisition of the Horse Creek LBA Tract by ACC will support the planned increase in coal production to 30 mmtpy and in employment to 250. Traffic levels from the mine will be maintained for a longer period under the action alternatives.

4.5.18 Socioeconomics

Because of all the energy-related development that has been occurring in and around Converse and Campbell Counties during the past 30 years, socioeconomic impacts are a major concern. Wyoming's economy has been structured around the basic industries of extractive minerals, agriculture, tourism, timber, and manufacturing. Each of these basic industries is important, and the extractive mineral industry has long been a vital part of Wyoming's economy. Many Wyoming communities depend on the mineral industry for much of their economic well being. The assessed valuation on total minerals produced in 1990 accounted for 91 percent of the state's total assessed valuation. Because most minerals are taxed as a percentage of their assessed valuation, this makes the mineral industry a significant revenue base for both local and state government in Wyoming (Department of Commerce, Economic and Community Development Division, Energy Section 1992).

Coal production in the PRB is projected by BLM to reach a record high of 319 million tons in the year 2002 before declining to about 295 million tons in 2005 (BLM 1996a). In contrast, WSGS projects coal production in Campbell County to increase by about 1% per year from 2000 through 2005, while Converse County coal production is projected to remain steady at 25 mmtpy through this period. In 1997, Wyoming coal supplied approximately 26% of the United States' steam coal needs when PRB coal was used to generate electricity for public consumption in 29 states as well as Canada and Spain (Lyman and Hallberg 1998). Electricity consumers in those states benefit from low coal prices for PRB coal, from cleaner air due to the low sulfur content of the coal, and from the royalties and bonus payments that the federal government receives from the coal.

Locally, continued sale of PRB coal helps stabilize municipal, county, and state economies. By 2005, annual coal production is projected to generate about $2.6 billion of total economic activity, including $351 million of personal income, and support the equivalent of nearly 15,885 full-time positions (BLM 1996a).

Two tracts, the Powder River and Thundercloud tracts, were recently leased in southern Campbell County and the surrounding area. Projected employment increases of up to 265 persons were predicted as a result of mining these tract. Up to 70 additional jobs are predicted if the Horse Creek LBA Tract is mined. In combination, mining of these three LBA tracts could result in up to 335 jobs. The population increase that could be associated with these jobs could be absorbed by the infrastructure in Converse and Campbell Counties, where population levels are below peak levels, particularly in Wright and Douglas. Also, additional workers would be dispersed among numerous communities including Douglas, Wright, Gillette and Newcastle, alleviating pressure on any one community.

In addition to the Horse Creek LBA Tract a number of mineral and related developments are anticipated in Campbell County and the surrounding area. The North Rochelle Mine located southeast of Wright, WY is currently completing an $83.6 million mine construction phase (Gillette News Record 1996b). Construction of the mine facilities began in June 1997 and is scheduled to be completed in 1999.

Construction of the $744 million ENCOAL plant was planned to coincide with the North Rochelle Mine expansion with construction starting in late 1997 and lasting approximately two years. A peak construction-phase work force of 1,560 persons was anticipated in the third quarter of 1998. The plant was scheduled to operate for at least 30 years and produce approximately 5,500 tons per day of solid fuel in full operation. The North Rochelle mine expansion and ENCOAL plant had been scheduled to go into operation in 1999 with a combined estimated operational work force of 222 persons. On August 29, 1997 ENCOAL announced that the contract for construction had been terminated. The company stated that they "...remain optimistic about the... technology...and...intend to continue to work toward construction of a commercial plant to meet the appropriate market timing..." (Zeigler Coal Holding Company, August 29, 1997). No additional plans for construction have been announced.

The Two Elk plant is currently in the developmental stage, and North American Power Group is working on permitting and marketing. Construction of the plant was expected to begin in the third quarter of 1997, however, construction has not yet begun. The cost for constructing the proposed plant is estimated at $290 million. Construction is expected to last approximately two years with a peak construction-phase work force of approximately 752 persons anticipated in the fourth quarter of the construction period.

According to information provided by the Dakota, Minnesota & Eastern Railroad Corporation, construction of the DM&E railroad line was expected to start in 1999, take two years and cost $1.5 billion. For Wyoming, the estimated direct construction-phase work force is 700 persons. DM&E in December 1998, got preliminary approval from the Surface Transportation Board, but must complete an environmental analysis as the next step of the approval process.

If the ENCOAL and Two Elk projects had started in 1997 as scheduled, increased employment in Campbell County would have peaked at 2,429 persons in the second quarter of 1998 during the construction phase. Depending on when construction begins on the ENCOAL and Two Elk plants and the DM&E railroad, there still could be overlapping construction employment. At the end of the construction phases, it is estimated that a total of about 300 workers would be employed by all three projects.

If all of these new projects are undertaken, it is estimated that the local populations of the communities in northeastern Wyoming would grow. If construction of North Rochelle, ENCOAL, and Two Elk had begun in 1997, as previously anticipated, it was estimated that non-local populations in northeastern Wyoming would have grown by 2,900 persons during the second half of 1998. The populations of Wright, Douglas, Newcastle, and Upton were projected to increase by approximately 1,751, while populations in other areas of Campbell, Converse, and Weston counties could have increased by 1,172. Under that scenario, the number of additional residents related to those three projects was expected to have been 455 after the construction phase. Currently, the North Rochelle construction project is almost completed. The ENCOAL, Two Elk and DM&E construction schedules are uncertain.

According to the Planning Information Corporation (1997), if construction had proceeded as planned for the North Rochelle Mine, the ENCOAL plant and the Two Elk plant, the Gillette area could have experienced a demand for 545 dwelling units during the second quarter of 1998, with the demand dropping to 75 dwelling units at the end of the construction phase. The number of dwelling units in demand in Wright could have increased to 273 during the peak phase of construction and dropped to 37 after the construction phase. Other areas that could have experienced some demand in housing during the peak phase on construction included Douglas, Newcastle and Upton. This could have created some housing shortages, especially in the temporary housing market. Some shortages still could occur if construction period for the remaining potentially planned projects overlap.

The effects of the three developmental projects could temporarily increase the total school enrollment if construction overlaps. The total number of students added to the Gillette and Wright school systems is projected at 140 and 70 students, respectively. This growth was anticipated to occur in the fourth quarter of 1998 but its timing is now uncertain.

During the construction phase of the developmental projects, assistance money could total $7.5 million for Gillette, $4.43 million for Campbell County and $527,000 for Wright (Planing Information Corp. 1997). Assuming local sales and use tax permits are required, the developmental projects if approved would generate about $12.5 million for Gillette, Wright and Campbell County. The State of Wyoming would receive approximately $16.99 million from the developmental projects. Ad valorem tax is paid on production and property (State of Wyoming; Department of Commerce, Energy Section 1997). If all three developmental projects proceed as planned, ad valorem tax paid in 2001 is estimated to approach $10 million (Gillette News Record 1996).

4.6 The Relationship Between Local Short-term Uses of Man's Environment and the Maintenance and Enhancement of Long-term Productivity

From 1999 on, the Antelope Mine would be able to produce coal at the permitted production level for another 17 years under the Proposed Action and for 18 years under Alternative 2. As the coal is mined, almost all components of the present ecological system, which have developed over a long period of time, would be modified. In partial consequence, the reclaimed land would be topographically lower, and although it would resemble original contours, it would lack some of the original diversity of geometric form.

The forage and associated grazing and wildlife habitat that the LBA tract provides would be temporarily lost during mining and reclamation. During mining of the LBA tracts, there would be a combined loss of native vegetation on 3,190 acres (Proposed Action) or 3,581 acres (Alternative 2) with an accompanying disturbance of wildlife habitat and grazing land. This disturbance would occur incrementally over a period of years. The mine site would be returned to equivalent or better forage production capacity for domestic livestock before the performance bond is released. Long-term productivity would depend largely on postmining range-management practices, which to a large extent would be controlled by private landowners.

Mining would disturb pronghorn habitat, but the LBA tract would be suitable for pronghorn following successful reclamation. Reduced topographic diversity in the breaks areas would make the area permanently less suitable for mule deer. Despite loss and displacement of wildlife during mining, it is anticipated that reclaimed habitat would support a diversity of wildlife species similar to premining conditions. The diversity of species found in undisturbed rangeland would not be completely restored on the leased lands for an estimated 50 years after the initiation of disturbance. Re-establishment of mature sagebrush habitat--which is crucial for pronghorn and sage grouse--could take even longer.

There would be a deterioration of the groundwater quality in the lease area because of mining; however, the water quality would still be adequate for livestock and wildlife. This deterioration would probably occur over a long period of time. During mining, depth to groundwater would increase as much as five miles away from the pits in the coal aquifer. The water levels in the coal aquifer should return to premining levels at some time (possibly more than 100 years) after mining has ceased.

Mining operations and associated activities would degrade the visual resources of the area on a short-term basis. Following removal of surface facilities and completion of reclamation, the long-term impact on visual resources would be negligible.

Short-term impacts to recreation values may occur from reduction in big game populations due to habitat disturbance. These changes would primarily impact hunting in the lease area. However, because reclamation would result in a wildlife habitat similar to that which presently exists, there should be no long-term adverse impacts on recreation.

The Proposed Action and Alternative 2 would extend the life of Antelope Mine by eight and nine years, thereby enhancing the long-term economy of the region.

4.7 Irreversible and Irretrievable Commitments of Resources

The major commitment of resources would be the mining and consumption of 246 million tons (Proposed Action) or 279 million tons (Alternative 2) of coal to be used for electrical power generation. CBM associated with this coal at the time it is mined would also be irreversibly and irretrievably lost. It is estimated that 1-2 percent of the energy produced would be required to mine the coal, and this energy would also be irretrievably lost.

The quality of topsoil on approximately 3,190 acres (Proposed Action) or 3,581 acres (Alternative 2) would be irreversibly changed. Soil formation processes, although continuing, would be irreversibly altered during mining-related activities. Newly formed soil material would be unlike that in the natural landscape.

Loss of life may conceivably occur due to the mining operation and vehicular and train traffic. On the basis of surface coal mine accident rates in Wyoming as determined by the Mine Safety and Health Administration (1997) for the 10-year period 1987-1996, fatal accidents (excluding contractors) occur at the rate of 0.003 per 200,000 man-hours worked. Disabling (lost-time) injuries occur at the rate of 1.46 per 200,000 man-hours worked. Any injury or loss of life would be an irretrievable commitment of human resources.

Disturbance of all known historic and prehistoric sites on the mine area would be mitigated to the maximum extent possible. However, accidental destruction of presently unknown archeological or paleontological values would be irreversible and irretrievable.

5.0 CONSULTATION AND COORDINATION

In addition to this EIS, other factors and consultations are considered and play a major role in determining the decision on this proposed lease application. These include the following.

Regional Coal Team Consultation. The Horse Creek lease application was reviewed and discussed at the April 23, 1997, PRRCT meeting in Casper, Wyoming. The PRRCT determined that the lands in the application met the qualifications for processing as a production maintenance tract and approved the application for processing by the lease-by-application method.

Governor's Consultation. The BLM Wyoming State Director notified the Governor of Wyoming on February 26, 1997 that ACC had filed a lease application with BLM for the Horse Creek Tract.

Public Notice. The BLM published a Notice of Scoping in the *Federal Register* on October 31, 1997 serving notice that the ACC coal lease application had been received and public comment was requested. A public scoping meeting was held on November 13, 1997 in Gillette, Wyoming. BLM published a Notice of Intent to Prepare an Environmental Impact Statement in the *Federal Register* on June 18, 1998. This notice included a second request for public comment to specifically address ACC's May 1, 1998 request for a modification to the lease tract. This second comment period was open through July 24, 1998, to allow consideration of any new comments in this draft EIS. The BLM and the EPA will each publish a Notice of Availability in the *Federal Register* for this draft EIS. The public comment period on this draft EIS will last 60 days. Following the comment period on the draft EIS, a final EIS will be prepared. Comments from the public, state and federal review agencies will be considered in preparing the final EIS, and BLM will respond to these comments in the final EIS.

Attorney General Consultation. After a coal lease sale, but prior to issuance of a lease, the BLM will solicit the opinion of the U.S. Attorney General on whether the planned lease issuance creates a situation inconsistent with federal anti-trust laws.

Other Consultations. Other federal, state, and local governmental agencies that were directly consulted in preparation of this EIS are listed in Table 5-1.

List of Preparers. Table 5-2 provides a listing of the BLM interdisciplinary team and the third-party consultant personnel who prepared this EIS.

Distribution List. This EIS was distributed to numerous congressional offices, federal agencies, state governments, local governments, industry representatives, interest groups, and individuals for their review and comment (Table 5-3).

Table 5-1. Other Federal, State, and Local Governmental Agencies Consulted in EIS Preparation

Agency or Organization	**Individual**	**Position**
Converse County	Mike Sears	Planning Director
Powder River Regional Coal Team	5 Voting Members and 21 Nonvoting Members	
Wyoming Game and Fish Department	Lynn Jahnke	Wildlife & Fish Supervisor
Wyoming Department of Environmental Quality		
Air Quality Division	Mike Warren	Sr. Analyst
	Dianna Grant	Sr. Analyst
	Tina Jenkins	Sr. Analyst
Land Quality Division	Jon Sweet	Sr. Analyst
	Lanny Goyn	Sr. Analyst
Wyoming State Geological Survey	Rod DeBruin	Oil & Gas Geologist
	Bob Lyman	Coal Geologist
Wyoming Oil and Gas Commission	Don Likwartz	Supervisor
Wyoming Department of Commerce	Dale Hoffman	Mineral Tax Division Director
Wyoming Department of Information and Administration	Wenlin Liu	Division of Economic Analysis, Senior Economist
Wyoming Department of Revenue	Dean Ternte	Sr. Economist

Table 5-2. List of Preparers

Name	Education/Experience	EIS Responsibility
BLM/USFS/OSM INTERDISCIPLINARY TEAM		
Core Team		
Nancy Doelger, BLM	M.S., B.S. Geology, 22 years professional experience (Licensed Wyoming Geologist)	Project Coordinator
Mike Karbs, BLM	M.S. Regional Planning and Public Policy, B.S. Mineral Engineering, 21 years professional experience	Document Reviewer
Mel Schlagel, BLM	M.S. Agricultural Economics, 31 years professional experience	Document Reviewer
Floyd McMullen, OSM	M.S. Environmental Science, B.S. Range/Forest Management, 23 years professional experience	Project Coordinator
Support Team		
Charlie Gaskill, BLM	M.S., B.S. Geology, 23 years professional experience (Licensed Wyoming Geologist)	Geologist
Mavis Love, BLM	17 years professional experience	Adjudicator
B.J. Earle, BLM	B.A. Archaeology, 21 years professional experience	Cultural Resources
Chris Arthur, BLM	B.A.M.A., Anthropology, 25 years professional experience	Cultural Resources
Laurie Bryant, BLM	Ph.D., Paleontology, 35 years profession experience	Paleontological Resources
Larry Gerard, BLM	B.S. Wildlife Management, 21 years professional experience	Wildlife Resources
Mike Brogan, BLM	B.S. Watershed Management/Hydrology /Forestry, 21 years professional experience	Hydrology
Joe Meyer, BLM	B.S. Watershed Management with Soils Minor, 16 years professional experience	Soils
Susan Caplan, BLM	B.S. Meteorology and Mathematics, M.S. Air Resource Management (in progress), 15 years professional experience	Air Quality
WESTERN WATER CONSULTANTS, INC.		
Doyl Fritz	M.S., B.S. Civil Engineering, 28 years professional experience (Licensed Professional Engineer)	Report Preparation
Mike Evers	M.S., B.S. Geology, 14 years professional experience (Licensed Wyoming Geologist)	Project Management, Report Preparation
Rodney Ventling	8 years professional experience	CADD
Heidi Peterson	7 years professional experience	Document Production

Table 5-2 Continued

POWDER RIVER EAGLE STUDIES		
Howard Postovit	M.S., B.S. Zoology, 20 years professional experience	Wildlife Baseline
Gwyn McKee	M.S., B.S. Wildlife Biology, 10 years professional experience	Wildlife Baseline
Mark Winland	B.S. Biology, 8 years professional experience	Wildlife Baseline
McVEHIL-MONNETT ASSOCIATES, INC.		
George McVehil	Ph.D., Certified Consulting Meteorologist, 35 years professional experience	Air Quality
Keith Baugues	B.S. Engineering, 25 years professional experience (Licensed Professional Engineer)	Air Pollutant Emission Evaluation
Edward Addison	B.S. Meteorology, M.S. Civil Engineering, 12 years professional experience	Air Quality Modeling

Table 5-3. Distribution List - Draft EIS

Powder River Regional Coal Team
Voting Members

Jim Geringer
Governor of Wyoming
Cheyenne, WY

Marc Racicot
Governor of Montana
Helena, MT

Al Pierson
BLM Wyoming State Director
Cheyenne, WY

Larry Hamilton
BLM Montana State Director
Billings, MT

Robert Bennett
BLM Deputy State Director
Minerals and Land
Cheyenne, WY

Powder River Regional Coal Team
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State Of Montana

Steve Reynolds
Dir. of Federal Land Policy
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Floyd McMullen
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Western Field Operations
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Medicine Bow National Forest
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Chas Cartwright
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Northern Cheyenne Tribal Council
Lame Deer, MT

Madame Chairman Clara Nomee
Crow Tribal Council
Crow Agency, MT

Tom Langston
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Gillette, WY

John Young
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Powder River County
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Bill Radden-Lesage
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Casper, WY

U.S. Senator Michael Enzi
Casper, WY
Gillette, WY

U.S. Senator Craig Thomas
Casper, WY
Sheridan, WY

Federal Agencies

Advisory Council on Historic Preservation
Golden, CO

Bureau of Indian Affairs
Washington D.C.

Bureau of Land Management
Rawlins, WY
Buffalo, WY
Mills, WY
Miles City, MT
Washington, D.C.

Bureau of Reclamation
Denver, CO
Washington D.C.

Dept. of Transportation
Washington, D.C.

Minerals Management Service
Denver, CO
Herndon, VA

National Park Service
Washington, D.C.

Office of Surface Mining Reclamation & Enforcement
Casper, WY
Denver, CO
Washington, D.C.

U.S. Fish & Wildlife Service
Washington, D.C.
Helena, MT

U.S. Army Corps of Engineers
Cheyenne, WY
Omaha, NE

U.S. Dept. of the Interior
OEPC, Washington, D.C.
Natural Resources Library, Washington, D.C.

U.S. Dept. of Agriculture
Forest Service
Washington, D.C.

U.S. Department of Energy
Washington, D.C.
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U.S. Environmental Protection Agency
Region VIII, Denver, CO
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State Government

Rep. George B. McMurtrey
Rozet, WY

Representative Jim Anderson
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Representative Rick Badgett
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Representative Eli D. Bebout
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Representative Bruce Burns
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Representative Nick Deegan
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Senator Bill Hawks
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Wyoming Dept. of Employment
Research and Planning
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Wyoming Department of Environmental Quality
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Wyoming Department of Transportation
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Wyoming Game & Fish Dept.
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Lander, WY
Sheridan, WY

Wyoming Industrial Siting Division
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Wyoming Oil and Gas Conservation Commission
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Wyoming Parks & Cultural Resources Department
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Wyoming Public Service Commission
Cheyenne, WY

Wyoming State Clearinghouse
Cheyenne, WY

Wyoming State Engineer's Office
Cheyenne, WY

Wyoming State Geological Survey
Laramie, WY

Wyoming State Inspector of Mines
Rock Springs, WY

Wyoming Water Development Commission
Cheyenne, WY

Local Government

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Gillette, WY

Campbell Co. Commissioners
Gillette, WY

Campbell County School Superintendent
Gillette, WY

City of Douglas
Douglas, WY

City of Gillette
Gillette, WY

Converse Co. Commissioner
Mr. Leon Chamberlain
Douglas, WY

Converse Co. Commissioners
Douglas, WY

Converse Co. Joint Powers Board
Douglas, WY

Converse Co. Planning Office
Douglas, WY

Converse Co. School District
Douglas, WY

Indian Tribes & Tribal Governments

William C'Hair
Arapahoe, WY

Haman Wise
Fort Washakie, WY

John Tarnesse
El Paso, TX

Francis Brown
Riverton, WY

Northern Arapahoe Business Council
Fort Washakie, WY

Arapahoe Tribal Council
Fort Washakie, WY

Shoshone Business Council
Fort Washakie, WY

Shoshone Tribal Council
Fort Washakie, WY

Shoshone Tribal Attorney
Ft. Washakie, WY

Clifford Long Sioux
Busby, MT

Crow Tribal Council
Crow Agency, MT

Crow Tribal Administration
Crow Agency, MT

Northern Cheyenne Cultural Committee
Lame Deer, MT

Northern Cheyenne Tribal Council
Lame Deer, MT

Steven Brady
Lame Deer, MT

Santee Sioux Tribal Council
Niobrara, NE

Cheyenne River Sioux Tribal Council
Eagle Butte, SD

Flandreau Santee Sioux Executive Committee
Flandreau, SD

Crow Creek Sioux Tribal Council
Fort Thompson, SD

Philip Under Baggage
Oglala Sioux Tribal Council
Pine Ridge, SD

Jack F. Trope
Cranford, NJ

Industry and Business

ABO Petroleum Corporation
Artesia, NM

AE Investments
Hartford, CT

Amax Coal West
Gillette, WY

Amerada Hess Corporation
Houston, TX

American Colloid Co.
Belle Fourche, SD

Anadarko Petroleum Corporation
Houston, TX

Anderman Oil Co.
Denver, CO

Andover Partners
Houston, Texas

Antelope Coal Company
Gillette, WY

Ark Land Company
Fairview, IL

Arnjac
Laramie, WY

Baccari & Associates
Sheridan, WY

Barrett Resources Corp.
Denver, CO

Betelgeuse Production
Navasota, TX

Box Creek Mineral Ltd Partnership
Douglas, WY

Bridgeview Coal Company
Farmington, PA

Bridle Bit Ranch Company
Gillette, WY

Burlington Northern Railroad Co.
Fort Worth, TX

Burns & McDonnell
Kansas City, MO

BXG, Inc.
Boulder, CO

Cannon Land & Livestock
Douglas, WY

C.H. Snyder Company
Kittanning, PA

CE&MT, Inc.
Gillette, WY

CH2M Hill
Englewood, CO

Chorney Oil Company
Lakewood, CO

Citation Oil & Gas Corp.
Gillette, WY

Club Oil & Gas Ltd
Denver, CO

Consol, Inc.
Pinckneyville, IL

Cordero-Rojo Mine Complex
Gillette, WY

DNR Oil & Gas, Inc.
Denver, CO

Davis Petroleum Co.
Denver CO

Decker Coal Company
Omaha, NE

Dice Exploration Co.
Houston, TX

Dilts Ranch Co.
Douglas, WY

Dome 1980 Institutional Investors
Denver, CO

Donald Linden Rasmussen & Co.
Pine, CO

Douglas Chamber of Commerce
Douglas, WY

Dry Fork Coal Company
Gillette, WY

ECC
Casper, WY

ENCOAL
Gillette, WY

Eagle Royalty & Mineral Co., Inc.
Casper, WY

Eland Energy, Inc.
Dallas TX

Evergreen Enterprises
Casper, WY

Foster-Wheeler
Environmental
Lakewood, CO

Exxon Corporation
Houston, TX

FDM Property Trust
Douglas, WY

Flying J Oil Y Gas, Inc.
(Re: Equitable Res. Energy)
North Salt Lake, UT

Forest Oil Corporation
Denver, CO

Four-Ten Exploration
Denver, CO

Gerald Jacob
Environmental Const.
Boulder, CO

Gillette Chamber of Commerce
Gillette, WY

Glenrock Coal Co.
Glenrock, WY

Greystone
Greenwood, CO

Hardin & Associates
Castle Rock, CO

Hat Creek Production Co.
San Antonio, TX

Howell Petroleum Corporation
Houston, TX

Ind. Consultant Network
Brian Kennedy
Boulder, CO

Intermountain Resources
Laramie, WY

JN Rxploration & Production
Billings, MT

Jacobs Ranch Coal Corp.
Gillette, WY

KN Gas Gathering/KN Energy
Lakewood, CO

Kaffka & Company
Denver, CO

Kennecott Energy Company
Gillette, WY

Kenneth R. Paulsen
Consulting
Arvada, CO

Kfx Wyoming
Gillette, WY

Kiewit Mining Co.
Sheridan, WY

L.E. Peabody & Associates
Alexandria, VA

LFL Joint Venture Investment
San Rafael, CA

Lancaster Corporation
Lakewood, CO

Lance Oil & Gas Co.
Denver, CO

M&K Oil Company
Gillette, WY

Marathon Oil Co
Houston, TX

Marston & Marston
St. Louis, MO

Maurice W. Brown
Cheyenne, WY

Maxus Exploration Co.
Dallas, TX

McGraw-Hill
Washington D.C.

Meineadair Consultants
Arvada, CO

Mine Engineers, Inc.
Cheyenne, WY

Mining Associates of Wyoming
Casper, WY

Mitchell Royalty
Haskell, OK

Mobil Oil Corporation
Dallas, TX

Myco Industries Inc.
Artesia, NM

National Grasslands Ltd Liability Co.
Douglas, WY

Nerco Coal Co.
Ione, CA

North Rochelle Mine
Gillette, WY

P&M Coal Company
Englewood, CO

PacifiCorp/Interwest Mining Company
Salt Lake City, UT

Phillips Petroleum Co.
Englewood, CO

Powell Exploration Co.
Denver, CO

Powder River Eagle Studies Inc.
Gillette, WY

Powder River Coal Company
Gillette, WY

Presidio Exploration, Inc.
Englewood, CO

Redle, Yonkee & Toner
Sheridan, WY

Redstone Resources
Denver, CO

Riverside Technology, Inc.
Fort Collins, CO

Royal Gold, Inc.
Denver, CO

Seguro Oil & Gas, Inc.
Denver, CO

Sharbro Oil Ltd. Co.
Artesia, NM

Sharpe Energy Co.
Richmond, VA

Shea & Gardner
Washington, D.C.

Sioux Ranch, Inc.
Wright, WY

Sonat Exploration Co.
Oklahoma City, OK

Swift Energy Co.
Denver, CO

TXP Operating Co.
Houston, TX

The Rim Companies
Englewood, CO

Thunder Basin Coal Company
Wright, WY

Torch Energy
Houston, TX

TRC Mariah Associates Inc.
Laramie, WY

TRC Environmental
Englewood, CO

Tri-County Electric Assoc.
Sundance, WY

Triton Coal Company
Gillette, WY

Union Pacific Resources Co.
Rock Springs, WY

US West Communications
Casper, WY
Denver, CO

Viking Resource Corp.
North Canton, OH

Wells Resources, Inc.
Little River, TX

Wellstar Corp.
Platteville, CO

Western Water Consultants, Inc.
Sheridan, WY

Western Gas Resources
Denver, CO

Western Fuels Association
Lakewood, CO

Western Energy Co.
Colstrip, MT

Westtex 66 Pipeline Co.
Oklahoma City, OK

Winco Petro Corp.
Garden Cit,y KS

Wright Chamber of Commerce
Wright, WY

Wyodak Resources Dev. Corporation
Gillette, WY

Yates Drilling Company
Artesia, NM

Interest Groups & Professional Societies

Audubon Society
Casper, WY
Cheyenne, WY
Sheridan, WY

Foundation for North American Wild Sheep
Cody, WY

Friends of the Bow/
Biodiversity Associates
Laramie, WY

Institute for Policy Research
Northwestern University
Evanston, IL

Izaak Walton League of America
Casper, WY

Inyan Kara Grazing Assoc.
Newcastle, WY

Medicine Wheel Alliance
Huntley, MT

National Mining Association
Washington, D.C.

National Wildlife Federation
Washinton, D.C.

Natural Resources Defense Council
San Francisco, CA

Petroleum Assoc. of Wyoming
Casper, WY

Powder River Basin Resource Council
Sheridan, WY

Sierra Club
Sheridan, WY

Sinapu
Boulder, CO

The Nature Conservancy
Laramie, WY

The Greens/Green Party USA
Chicago, IL

Thunder Basin Grazing Assoc
Douglas, WY

Wind River Multiple Use Advocates
Riverton, WY

Wyoming Stock Growers Assoc.
Cheyenne, WY

Wyoming Wildlife Federation
Cheyenne, WY

Wyoming Geological Assoc.
Casper, WY

Wyoming Outdoor Council
Lander, WY

Wyoming Association of Professional Archaeologists
Casper, WY
Laramie, WY

Wyoming Wool Growers Association
Casper, WY

Wyoming Mining Association
Cheyenne, WY

Wyoming Multiple Use Coalition
Casper, WY

Wyoming Heritage Society
Casper, WY

Individuals

Myra Mae Kane Addison
A.G. Andrikopoulus
Pauline T. Baker
Ralph Barbero
Scott Benson
Sheldon Bierman
Valerie Jan Jacobs Bishop
K.M. Blake
Bonnie J. Brown
David S. Brown
Cecil Cundy
Barbara & Jerry Dilts
Ladd Frary
Elizabeth Goodnough
Shawn Grindstaff
Russell O. Hanson
H. Allen Higgins
Nancy Higgins
Matthew Lee Isenberger
Rosemae Jacobs
Donald B. Jacobs
Elvin J. Janssen
John M. Jones
Pat Litton
Frank Wright Kane
Ollie M Kane
Gregor Klurfeld
Dennis Kuryla
Jeanne C. Lankford
David W. Liford
Louis S. Madrid
Betty Ruth McCoy
Karan Lea Kane McCurley
James D. McLean
Tom Mills
Larry Mills
C.D. Mitchell Trustee
Victor & Cynthia Mitchell
George E. Moe
Dennis Morgan
Clifford B. Nash
F. L. Natta
Jolynn Jacobs Nimmo
Ted Olson
Susan M. Ostling
Michael E. Ostling
John Pexton
John Brent Probst
Asa Reed
Rex L. Randolph
Kathleen Kane Reynolds
Robert C. Richman
Edna Ruth Risha et al Co-Trustee
C.J. Robertson
Bill Saulcy
Dorothy L. Shapr
Dave Shippy
F.L. Shogrin
Steve Simunek
Billie Ruth Snow
John A. Stovall
Norman F. Taylor
Anthony F. Turski, Jr.
Joy Lunn Kane Voiles
Nedra F. Walker
Conrad Weinlein
John Williams
Mark Winland

Ernest E. Worden

Nicholas Wylie

John A York

Libraries

The Libraries
Colorado State University
Fort Collins, CO

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Laramie, WY

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Washington, D.C.

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Denver, CO

Western Coal Newsletter
Knoxville, TN

Cheyenne-Wyoming Eagle
Cheyenne, WY

Associated Press
Cheyenne, WY

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Casper, WY

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Douglas, WY

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7.0 GLOSSARY

aboriginal - Related to early or primitive cultures in a region.

ad valorem tax - A tax paid as a percentage of the assessed value of property.

adverse impact -An apparent direct or indirect detrimental effect.

aliquot - An exact portion.

alkalinity - The degree to which the pH of a substance is greater than 7.

alluvial deposit - Deposits of clay, silt, sand, gravel, and/or other materials carried by moving surface water, such as streams, and deposited at points of weak water flow; alluvium.

alluvial valley floors (AVFs) - An area of unconsolidated stream-laid deposits holding streams with water availability sufficient for subirrigation or flood irrigation agricultural activities (see 30 CFR 701.5).

alluvium - Sorted or semi-sorted sediment consisting of clay, silt, sand, gravel, or other unconsolidated rock material deposited in comparatively recent geologic time by a stream or other body of running water in the bed of that stream or on its flood plain or delta.

alternative - In terms of the National Environmental Policy Act, one of several substitute or alternate proposals that a federal agency is considering in an environmental analysis.

ambient -Surrounding conditions (or environment) in a given place and time.

annual precipitation - The quantity of water that falls yearly in the form of rain, hail, sleet, and snow.

approximate original contour - Post-mining surface configuration achieved by backfilling and grading of mined-out areas so that the reclaimed land surface resembles the general surface configuration of the land prior to mining (see 30 CFR 701.5).

aquatic - Living or growing in or on the water.

aquifer - A layer of permeable rock, sand, or gravel that stores and transmits water in sufficient quantities for a specific use.

arithmetic mean - The sum of the values of n numbers divided by n. It is usually referred to as simply the "mean" or "average".

ash - The residual non-combustible matter in coal that comes from included silt, clay, silica, or other substances. The lower the ash content, the better the quality of the coal.

avian - Of, relating to, or derived from birds.

backfill - The operation of refilling an excavation. Also, the material placed in an excavation when it is refilled.

baseline - Conditions, including trends, existing in the human environment before a proposed action is begun; a benchmark state from which the environmental consequences of an action are forecast; the no-action alternative.

beneficial impact - An apparent direct or indirect advantageous effect.

bentonite - A clay formed by the decomposition of volcanic ash which has the ability to absorb large amounts of water and to expand to several times its normal volume; used in adhesives, cements and ceramic fillers.

bonus - That value in excess of the rentals and royalties that is paid to the United States as part of the consideration for receiving a lease for publicly owned minerals [see 43 CFR 3400.0-5(c)].

braided stream - A stream flowing in several dividing and reuniting channels resembling the strands of a braid.

buffer zone - An area between two different land uses that is intended to resist, absorb, or otherwise preclude development or intrusion between the two use areas.

bypass coal - An isolated part of a coal deposit that is not leased and that can only be economically mined in an environmentally sound manner as a part of continued mining by an existing adjacent operation [see 43 CFR 3400.0.5(d)].

clinker (scoria) - Baked and fused rock resulting from in-place burning of coal deposits.

coal bed methane - Methane gas that is generated during the coal-forming process.

colluvium - Rock fragments, sand, or soil material that accumulates at the base of slopes; slope wash.

confluence - The point at which two or more streams meet.

conglomerate - A rock that contains rounded rock fragments or pebbles cemented together by another mineral substance.

contiguous - Lands or legal subdivisions having a common boundary, lands having only a common corner are not contiguous.

cooperating agency - An agency which has jurisdiction by law in an action being analyzed in an environmental document and who is requested to participate in the NEPA process by the agency that is responsible for preparing the environmental document [see 40 CFR 1501.6 and 1508.5].

crucial wildlife habitat - Parts of the habitat necessary to sustain a wildlife population during periods of their life cycle. It may be a limiting factor on the population, such as nesting habitat or winter habitat.

cultural resources - The remains of human activity, occupation, or endeavor reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features that reveal the nature of historic and prehistoric human events. These resources consist of (1) physical remains, (2) areas where significant human events occurred, and (3) the environment immediately surrounding the resource.

cumulative impact - The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

decibel - A unit of sound measurement. In general, a sound doubles in loudness for every increase of 10 decibels.

dip - The angle at which a rock layer is inclined from the horizontal.

direct (or primary) impact - An impact caused by an action that occurs at the same time and place as the action (see 40 CFR 1508.8).

discharge - Any of the ways that ground water comes out of the surface, including through springs, creeks, or being pumped from a well.

dissected upland - An upland or high area in which a large part of the original surface has been deeply cut into by streams.

dragline - A type of excavating crane that casts a rope- or cable-hung bucket a considerable distance, collects the dug material by pulling the bucket toward itself on the ground with a second rope or cable, elevates the bucket, and dumps the material on a backfill bank or pile.

eolian deposit - Sediment carried, formed, or deposited by the wind, as sand dunes.

ephemeral stream - A stream that flows occasionally because of surface runoff, and is not influenced by permanent ground water.

erosion - The wearing away of the land surface by running water, wind, ice or other geologic agents.

evapotranspiration - The sum total of water lost from the land by evaporation and plant transpiration.

excavation (archeological) - The scientifically controlled recovery of subsurface materials and information from a cultural site. Recovery techniques are relevant to research problems and are designed to produce maximum knowledge about the site's use, its relation to other sites and the natural environment, and its significance in the maintenance of the cultural system.

fair market value - The amount in cash, or in terms reasonably equivalent to cash, for which in all probability a coal deposit would be sold or leased by a knowledgeable owner willing but not obligated to sell or lease to a knowledgeable purchaser who desires but is not obligated to buy or lease.

fixed carbon - In coal, the solid combustible material remaining after removal of moisture, ash, and volatile matter. It is expressed as a percentage.

floodplain -The relatively flat area or lowland adjoining a body of flowing water, such as a river or stream, that is covered with water when the river or stream overflows its banks.

forage - Vegetation used for food by wildlife, particularly big game wildlife, and domestic livestock.

formation (geologic) - A rock body distinguishable from other rock bodies and useful for mapping or description. Formations may be combined into groups or subdivided into members.

fossil - The remains or traces of an organism or assemblage of organisms that have been preserved by natural processes in the earth's crust. Many minerals that may be of biologic origin are not considered to be fossils (e.g. oil, gas, asphalt, limestone).

geometric mean - The nth root of the product of the values of n positive numbers.

ground water - Subsurface water that fills available openings in rock or soil materials to the extent that they are considered water saturated.

habitat - A place where a plant or animal naturally or normally lives and grows.

habituation - The process of becoming accustomed to, or used to, something; acclimation.

hazardous materials - Substance which, because of its potential for corrosivity, toxicity, ignitability, chemical reactivity, or explosiveness, may cause injury to persons or damage to property.

hazardous waste - Those materials defined in Section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, and listed in 40 CFR § 261.

heterogenous - Made up of dissimilar constituents.

human environment - The natural and physical environment and the relationship of people with that environment (see 30 CFR 1508.14).

hydraulic conductivity - The capacity of a medium to transmit water; permeability coefficient. Expressed as the volume of water at the prevailing temperature that will move in unit time under a unit hydraulic gradient through a unit area. Units include gallons per day per square foot, centimeters per second.

hydraulic - Pertaining to fluid in motion, or to movement or action caused by water.

hydric soil - A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic (water-loving) vegetation. Hydric soils that occur in areas having positive indicators of hydrophytic vegetation and wetland hydrology are wetland soils.

hydrocarbon - Any organic compound, gaseous, liquid, or solid, consisting solely of carbon and hydrogen.

hydrogeology - The science that deals with subsurface waters and with related geologic aspects of surface waters.

hydrology - The science dealing with the behavior of water as it occurs in the atmosphere, on the surface of the ground, and underground.

hydrophytic vegetation - The plant life growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content. When hydrophytic vegetation comprises a community where indicators of hydric soils and wetland hydrology also occur, the area has wetland vegetation.

impermeable - Not capable of transmitting fluids or gasses in appreciable quantities.

incised - Having a margin that is deeply and sharply notched.

indirect (or secondary) impact - A reasonably foreseeable impact resulting from an action but occurring later in time than or removed in distance from that action (see 40 CFR 1508.8).

in-place coal reserves - The estimated volume of all of the coal reserves in a lease without considering economic or technological factors which might restrict mining.

in-situ leach mining - Removal of the valuable components of a mineral deposit through chemical leaching without physical extraction of the rock.

interbedded - Layers of one type of rock, typically thin, that are laid between or that alternate with layers of another type of rock.

interburden -A layer of sedimentary rock that separates two mineable coal beds.

interdisciplinary - Characterized by participation or cooperation among two or more disciplines or fields of study.

intermittent stream - A stream that does not flow year-round but has some association with ground water for surface or subsurface flow.

laminated - Consolidated or unconsolidated sediment that is characterized by thin (less than 1 cm thick) layers.

land and resource management plan (LRMP) - A land use plan that directs the use and allocation of U.S. Forest Service lands and resources.

lead agency - The agency or agencies preparing or having taken primary responsibility for preparing an environmental document (see 40 CFR 1508.16).

lease (mineral) - A legal document executed between a mineral owner or lessor and another party or lessee which grants the lessee the right to extract minerals from the tract of land for which the lease has been obtained [see 43 CFR 3400.0-5(r)].

lek - A traditional breeding area for grouse species where territorial males display and establish dominance.

lenticular - Term describing a body of rock or earth that thins out in all directions from the center like a double convex optical lens.

limb (geologic) - One side of a fold (syncline or anticline).

limestone - A sedimentary rock consisting chiefly of calcium carbonate.

lineament - A linear topographic feature of regional extent that is believed to reflect crustal structure.

loadout facilities - The mine facilities used to load the mined coal for transport out of the mine.

loam - A rich, permeable soil composed of a mixture of clay, silt, sand, and organic matter.

maintenance tract - A federal coal tract that would continue or extend the life of an existing coal mine.

major federal action - An action with effects that may be major and which is potentially subject to federal control and responsibility (see 40 CFR 1508.18).

maximum economic recovery (MER) - The requirement that, based on standard industry operating practices, all profitable portions of a leased federal coal deposit must be mined. MER determinations will consider existing proven technology; commercially available and economically feasible equipment; coal quality, quantity, and marketability; safety, exploration, operating, processing, and transportation costs; and compliance with applicable laws and regulations [see 43 CFR 3480.0-5(a)(24)].

meteorological -Related to the science dealing with the atmosphere and its phenomena, especially as relating to weather.

methane - A colorless, odorless, and inflammable gas; the simplest hydrocarbon; chemical formula = CH_4. It is the principal constituent of natural gas and is also found associated with crude oil and coal.

mineable coal - Coal that can be economically mined using present day mining technology.

mineral rights - The rights of one who owns the mineral estate (subsurface).

mining permit - A permit to conduct surface coal mining and reclamation operations issued by the state regulatory authority pursuant to a state program or by the Secretary pursuant to a federal program (see 30 CFR 701.5).

mitigation - An action to avoid, minimize, reduce, eliminate, replace, or rectify the impact of a management practice.

mudstone - A hardened sedimentary rock consisting of clay. It is similar to shale but lacks distinct layers.

National Register of Historic Places (NRHP) - A list of districts, sites, buildings, structures and objects significant in American history, architecture, archeology and culture maintained by the Secretary of the Interior. Expanded as authorized by Section 2(b) of the Historic Sites Act of 1935 (16 U.S.C. 462) and Section 101(a)(1) (A) of the National Historic Preservation Act.

natural gas - Combustible gases (such as hydrocarbons) or mixtures of combustible gases and non-combustible gases (such as helium) which are in a gaseous phase at atmospheric conditions of temperature and pressure.

NEPA process - All measures necessary for compliance with the National Environmental Policy Act of 1969 (see 40 CFR 1508.21).

no action alternative - An alternative where no activity would occur. The development of a no action alternative is required by regulations implementing the National Environmental Policy Act (40 CFR 1502.14). The no action alternative provides a baseline for estimating the effects of other alternatives.

outcrop -A rock formation that appears at or near the surface; the intersection of a rock formation with the surface.

overburden - Material of any nature, consolidated or unconsolidated, that overlies a coal or other useful mineral deposit, excluding topsoil.

paleontological resource - A site containing evidence of plant or non-human animal life of past geological periods, usually in the form of fossil remains.

peak discharge or flow - The highest discharge of water recorded over a specified period of time at a given stream location; also called maximum flow. Often thought of in terms of spring snowmelt, summer, fall or winter rainy season flows.

perennial species (vegetation) - Vegetation that lives over from season to season.

perennial stream - A stream or part of a stream that flows continuously during the calendar year as a result of groundwater discharge or surface runoff.

permeability - The ability of rock or soil to transmit a fluid.

permit application package - A proposal to conduct surface coal mining and reclamation operations on federal lands, including an application for a permit, permit revision, or permit renewal and all the information required by SMCRA, the applicable state program, any applicable cooperative agreement, and all other applicable laws and regulations including, with respect to federal leased coal, the Mineral Leasing Act and its implementing regulations.

permit area - The area of land, indicated on the approved map submitted by the operator with his or her application, required to be covered by the operator's performance bond under the regulations at 30 CFR Part 800 and which shall include the area of land upon which the operator proposes to conduct surface coal mining and reclamation operations under the permit, including all disturbed areas (see 30 CFR 701.5).

physiography - Physical geography.

piezometer - A well, generally of small diameter, that is used to measure the elevation of the water table.

playa - The sandy, salty, or mud-caked flat floor of a basin with interior drainage, usually occupied by a shallow ephemeral lake during or after rain or snow storms.

point source (pollution) - A point at which pollution is added to a system, either instantaneously or continuously. An example is a smokestack.

porosity - The percentage of the bulk volume of rock, sediment or soil that is not occupied by sediment or soil particles; the void space in rock or sediment. It may be isolated or connected.

postmining topography - The relief and contour of the land that remains after mining has been completed.

potentiometric surface - The surface that coincides with the static level of water in an aquifer. The surface is represented by the levels to which water from a given aquifer will rise under its full hydrologic head.

predator - An animal that obtains food by killing and consuming other animals.

prime or unique farmland - Those lands which are defined by the Secretary of Agriculture in 7 CFR part 657 (*Federal Register* Vol. 4 No. 21) and which have historically been used for cropland (see 30 CFR 701.5).

proposed action - In terms of National Environmental Policy Act, the project, activity, or action that a federal agency proposes to implement or undertake and which is the subject of an environmental analysis.

qualified surface owner - the natural person or persons (or corporation, the majority stock of which is held by a person or persons otherwise meeting the requirements of this section) who:

(1) Hold legal or equitable title to the surface of split estate lands;

(2) Have their principal place of residence on the land, or personally conduct farming or ranching operations upon a farm or ranch unit to be affected by surface mining operations; or received directly a significant portion of their income, if any, from such farming and ranching operations; and

(3) have met the conditions of (1) and (2) above for a period of at least three years, except for persons who gave written consent less than three years after they met the requirements of both (1) and (2) above [see 43 CFR 3400.0-5(gg)].

raptor - Bird of prey, such as an eagle, falcon, hawk, owl, or vulture.

recharge - The processes by which groundwater is absorbed into a zone of saturation.

reclamation - Rehabilitation of a disturbed area to make it acceptable for designated uses. This normally involves regrading, replacement of topsoil, revegetation and other work necessary to restore the disturbed area for post-mining use.

record of decision (ROD) - A document separate from, but associated with, an environmental impact statement that publicly and officially discloses the responsible official's decision on the proposed action (see 40 CFR 1505.2).

recoverable coal- The amount of coal that can actually be recovered for sale from the demonstrated coal reserve base.

rental payment - Annual payment from a lessee to a lessor to maintain the lessee's mineral lease rights.

resource management plan (RMP) - A land use plan, as prescribed by FLPMA, that directs the use and allocation of public lands and resources managed by BLM. Prior to selection of the RMP, different alternative management plans are compared and evaluated in an environmental impact statement (EIS) to determine which plan will best direct the management of the public lands and resources.

revegetation - The reestablishment and development of self-sustaining plant cover following land disturbance. This may occur through natural processes, or the natural processes may be enhanced by human assistance through seedbed preparation, reseeding, and mulching.

right of way (ROW) - The right to pass over property owned by another. The strip of land over which facilities such as roadways, railroads, or power lines are built.

riparian - The area adjacent to rivers and streams that lies between the stream channel and upland terrain and that supports specific vegetation influenced by perennial and/or intermittent water.

royalty (mineral) - A share of production that is free of the expense of production. It is generally paid by a lessee to a lessor of a mineral lease as part of the terms of the lease.

runoff - That portion of rainfall that is not absorbed; it may be used by vegetation, lost by evaporation, or it may find its way into streams as surface flow.

salinity - Refers to the solids, such as sodium chloride (table salt) and alkali metals, that are dissolved in water. Often in non saltwater areas, total dissolved solids is used as an equivalent term.

sandstone - A common sedimentary rock primarily composed of sand grains, mainly quartz, that are cemented together by other mineral material.

scoping - A public informational process required by the National Environmental Policy Act to determine private and public concerns, scope of issues, and/or questions regarding a proposed action to be evaluated in an environmental impact analysis.

scoria (clinker) - Baked and fused rock resulting from in-place burning of coal deposits.

sedimentation pond - An impoundment used to remove solids from water in order to meet water quality standards or effluent limitations before the water leaves the permit area (see 30 CFR 701.5).

semi-arid - A climate or region characterized by little yearly rainfall and by the growth of a number of short grasses and shrubs.

severance tax - A tax on the removal of minerals from the ground.

shale - A very fine-grained clastic rock or sediment consisting predominately of clay-sized particles that is laminated; lithified, layered mud.

significant impact - A qualitative term used to describe the anticipated importance of impacts to the human environment as a result of an action.

siltstone - A fine-grained clastic rock consisting predominately of silt-sized particles.

socioeconomics - The social and economic situation that might be affected by a proposed action.

soil survey - The systematic examination, description, classification, and mapping of soils in an area, usually a county. Soil surveys are classified according to the level of detail of field examination. Order I is the most detailed and Order V is the least detailed.

spontaneous combustion - The heating and slow combustion of coal and coaly material initiated by the absorption of oxygen.

stipulations - Requirements that are part of the terms of a mineral lease. Some stipulations are standard on all Federal leases. Other stipulations may be applied to specific leases at the discretion of the surface management agency to protect valuable surface resources or uses existing on those leases.

storage coefficient - The volume of water that can be released from storage per unit surface area of a saturated confined aquifer, per unit decline in the component of hydraulic head normal to the surface. It is calculated by taking the product of the specific storage and the aquifer thickness.

stratigraphic - Of, relating to, or determined by stratigraphy, which is the branch of geology dealing with the study of the nature, distribution, and relations of layered rocks in the earth's crust.

stripping ratio - The unit amount of overburden that must be removed to gain access to a similar unit amount of coal.

subirrigation - In alluvial valley floors, the supplying of water to plants from underneath, or from a semi-saturated or saturated subsurface zone where water is available for use by vegetation (see 30 CFR 701.5).

subbituminous -A lower rank of coal (35-45% carbon) with a heating value between that of bituminous and lignite, usually 8,300-11,500 Btu per pound. Subbituminous coal contains a high percentage of volatile matter and moisture.

surface disturbance - Any disturbance by mechanical actions which alters the soil surface.

surface rights - Rights to the surface of the land, does not include rights to oil, gas, or other subsurface minerals or subsurface rights.

suspended solids - The very fine soil particles which remain in suspension in water for a considerable period of time without contact with the stream or river channel bottom.

tectonic fracture - Fractures caused by deformation of the earth's crust.

threatened and endangered (T&E) species - These species of plants or animals classified as threatened or endangered pursuant to section 4 of the Endangered Species Act. Any species which is in danger of extinction, or is likely to become so within the foreseeable future.

> ***Category 1*** - Substantial biological information on file to support the appropriateness of proposing to list as endangered or threatened.
>
> ***Category 2*** - Current information indicates that proposing to list as endangered or threatened is possibly appropriate, but substantial biological information is not on file to support an immediate ruling (U.S. Fish and Wildlife Service).

topography - Physical shape of the ground surface; the configuration of land surface including its relief, elevation, and the position of its natural and manmade features.

topsoil - The surface layer of a soil.

total dissolved solids (TDS) - The total quantity in milligrams per liter of dissolved materials in water.

transmissivity - The rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient. Equals the hydraulic conductivity multiplied by the aquifer thickness. Values are given in units of gallons per day per foot.

transpiration - The discharge of water vapor by plants.

truck & shovel - A mining method used to remove overburden and coal in a strip mining operation. Truck and shovel operations use large bucket-equipped digging and loading machines (shovels) and large dump trucks to remove overburden instead of using a dragline for overburden removal.

typic - Typical.

unsuitability criteria - The 20 criteria described in 43 CFR 3461, the application of which results in an assessment of federal coal lands as suitable or unsuitable for surface coal mining.

uranium - A very hard, heavy, metallic element that is crucial to development of atomic energy.

vegetation type - A kind of existing plant community with distinguishable characteristics described in terms of the present vegetation that dominates an area.

vertebrate fossils - The remains of animals that possessed a backbone; examples are fish, amphibians, reptiles, dinosaurs, birds, and mammals.

vesicular - Rock containing many small cavities which were formed by the expansion of a bubble of gas or steam during the solidification of the rock.

visual resources - The physical features of a landscape which can be seen (e.g., land, water, vegetation, structures, and other features).

Visual Resource Management (VRM) - The systematic means to identify visual values, establish objectives which provide the standards for managing those values, and evaluate the visual impacts of proposed projects to ensure that objectives are met.

volatile matter - In coal, those substances, other than moisture, that are given off as gas or vapor during combustion.

waterfowl - A bird that frequents water, especially a swimming bird.

wetlands - Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient, under normal circumstances, to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands include marshes, bogs, sloughs, potholes, river overflows, mud flats, wet meadows, seeps, and springs [see 33 CFR 328.3(a)(7)(b)].

wild and scenic river - Rivers or sections of rivers designated by Congressional actions under the 1968 Wild and Scenic Rivers Act as wild, scenic, or recreational by an act of the Legislature of the state or states through which they flow. Wild and scenic rivers may be classified and administered under one or more of the following categories:

> **wild river areas** - Rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.
>
> **scenic river areas** - Rivers or sections of rivers that are free of impoundments, with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.
>
> **recreational river areas** - Rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

wilderness - An area of undeveloped Federal land designated wilderness by Congress, retaining its primeval character and influence, without permanent improvements or human habitation, protected and managed to preserve its natural conditions and that (1) generally appears to have been affected primarily by the forces of nature with the imprint of man's work substantially unnoticeable, (2) has outstanding opportunities for solitude or primitive and unconfined recreation, (3) has at least 5,000 acres or is of sufficient size to make practical its preservation and use in an unimpaired condition, and (4) also may contain features that are of ecological, geological, scientific, educational, scenic, or historical value. These characteristics were identified by Congress in the Wilderness Act of 1964.

APPENDIX A

FEDERAL AND STATE PERMITTING REQUIREMENTS AND AGENCIES

APPENDIX A: FEDERAL AND STATE AGENCIES & PERMITTING REQUIREMENTS

Agency	Lease/Permit/Action
FEDERAL	
Bureau of Land Management	Coal Lease Resource Recovery & Protection Plan Scoria Sales Contract Exploration Drilling Permit
Office of Surface Mining Reclamation and Enforcement	Preparation of Mining Plan Approval Document SMCRA Oversight
Office of the Secretary of the Interior	Approval of Mining Plan
Mine Safety and Health Administration	Safety Permit and Legal ID Ground Control Plan Major Impoundments Explosives Use and Storage Permit
Bureau of Alcohol, Tobacco, and Firearms	Explosive's Manufacturer's License Explosives Use and Storage Permit
Federal Communication Commission	Radio Permit: Ambulance Mobile Relay System Radio License
Nuclear Regulatory Commission	Radioactive By-Products Material License
Army Corps of Engineers	Authorization of Impacts to Wetlands and Other Waters of the U.S.
Department of Transportation	Hazardous Waste Shipment Notification
Federal Aviation Administration	Radio Tower Permits
STATE	
State Land Commission	Coal Lease Scoria Lease
Department of Environmental Quality-Land Quality Division	Permit and License to Mine
Department of Environmental Quality-Air Quality Division	Air Quality Permit to Operate Air Quality Permit to Construct
Department of Environmental Quality-Water Quality Division	National Pollutant Discharge Elimination System Water Discharge Permit Permit to Construct Sedimentation Pond Authorization to Construct Septic Tank & Leach Field Authorization to Construct and Install a Public Water Supply and Sewage Treatment System
Department of Environmental Quality-Solid Waste Management Program	Solid Waste Disposal Permit-Permanent and Construction
State Engineer's Office	Appropriation of Surface Water Permits Appropriation of Ground Water Permits
Industrial Siting Council	Industrial Siting Certificate of Non-Jurisdiction
Department of Health	Radioactive Material Certificate of Registration

APPENDIX B

UNSUITABILITY CRITERIA FOR THE HORSE CREEK LBA TRACT

Appendix B. Unsuitability Criteria for the Horse Creek LBA Tract

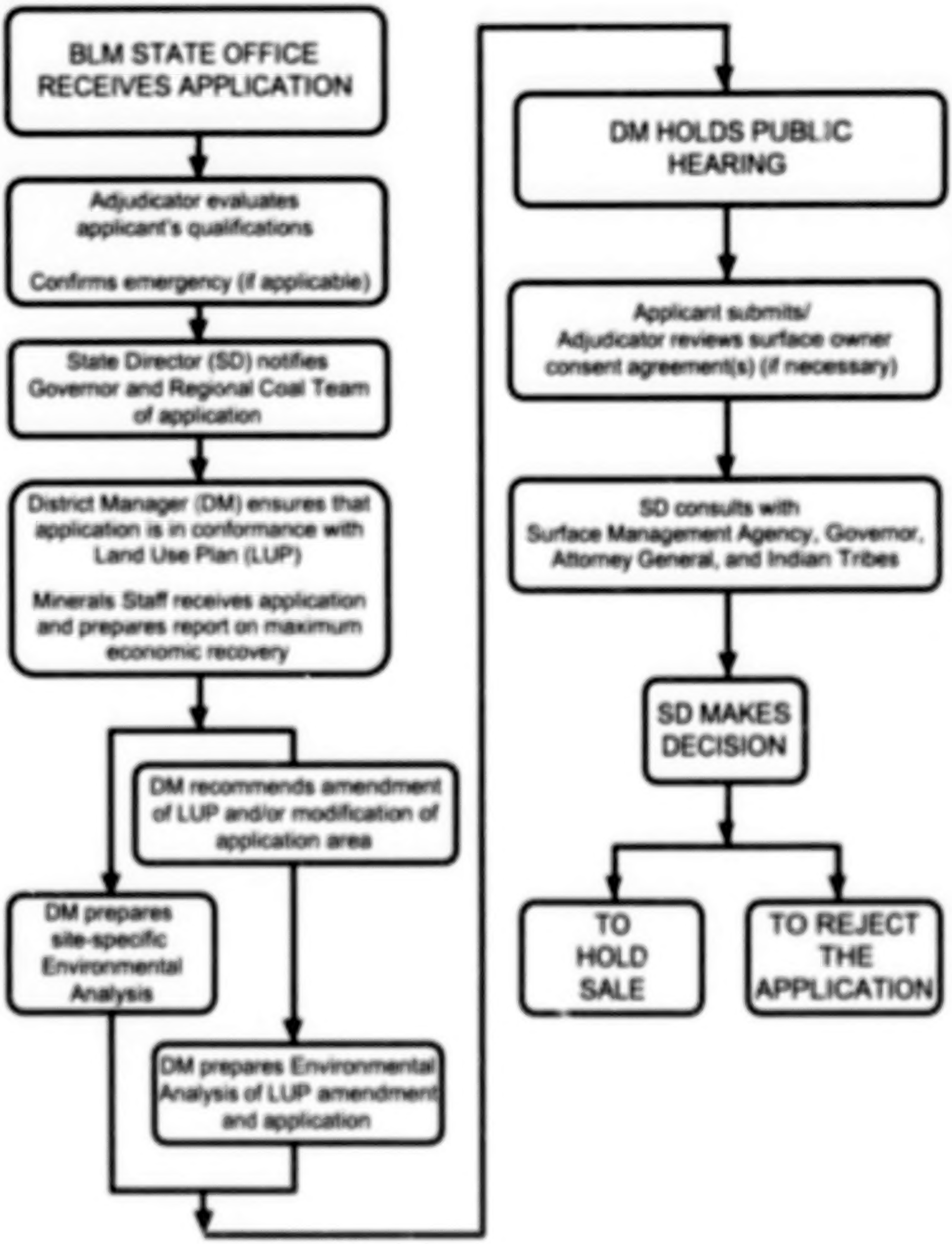
UNSUITABILITY CRITERIA	GENERAL FINDINGS FOR BLM BUFFALO AND PLATTE RIVER RESOURCE AREAS (BLM 1985a 1985b) and TBNG (USFS 1985)	VALIDATION FOR HORSE CREEK LBA TRACT
1. Federal Land Systems. With certain exceptions that do not apply to this tract, all federal lands included in the following systems are unsuitable for mining: National Parks, National Wildlife Refuges, National System of Trails, National Wilderness Preservation System, National Wild and Scenic Rivers, National Recreation Areas, Lands Acquired through the Land and Water Conservation Fund, National Forests and federal lands in incorporated cities, towns and villages.	None of the listed federal lands categories are present within the study area. TBNG is not part of a national forest and no TBNG lands are included in the Horse Creek Tract.	None of the listed federal lands are present on the Horse Creek LBA tract, and the tract therefore is not unsuitable for mining.
2. Rights-Of-Way and Easements. Federal lands that are within rights-of-way or easements or within surface leases for residential, commercial, industrial or other public purposes, on federally owned surface, are unsuitable for mining.	The general area contains two rights-of-way that meet the intent of this criterion: BN-UP railroad and the Tri-County 230 Kv transmission line.	The Tri-County 230 Kv transmission line is not on the LBA tract. The BN-UP right-of-way is on a portion of the LBA tract. The lease will be stipulated to exclude mining within the railroad right-of-way.
3. Dwellings, Roads, Cemeteries, and Public Buildings. Federal lands within 100 feet of a right-of-way of a public road or a cemetery, or within 300 feet of any public building, school, church, community or institutional building or public park; or within 300 feet of an occupied dwelling are unsuitable for mining.	The regional RMP's list a school at Wilkinson Ranch headquarters, Wyoming State Highway 59, and 5 ranch headquarters that meet the intent of this criterion.	None of the listed rights-of-way or buildings are on the LBA tract, and the tract is therefore not unsuitable for mining. County Road 37 has already been relocated to accommodate mining. However, ACC does not plan to move this road again, therefore, the lease will be stipulated to exclude mining within 100 ft of this right-of-way.
4. Wilderness Study Areas. Federal lands designated as wilderness study areas are unsuitable for mining while under review for possible wilderness designation.	No lands within the review area are within a wilderness study area.	There are no unsuitable findings, and the Horse Creek LBA Tract is not unsuitable for mining.
5. Lands with Outstanding Scenic Quality. Scenic federal lands designated by visual resource management analysis as Class I (outstanding visual quality or high visual sensitivity) but not currently on National Register of Natural Landmarks are unsuitable.	No lands in Campbell or Converse County meet the scenic criteria as outlined.	There are no unsuitable findings, and the Horse Creek LBA Tract is not unsuitable for mining.
6. Land Used for Scientific Study. Federal lands under permit by the surface management agency and being used for scientific studies involving food or fiber production, natural resources, or technology demonstrations and experiments are unsuitable for the duration of the study except where mining would not jeopardize the purpose of the study.	No lands in the general review area are under permit except small enclosures being used to gage reclamation success on existing mines.	There are no unsuitable findings, and the Horse Creek LBA Tract is not unsuitable for mining.
7. Historic Lands and Sites. All publicly or privately owned places which are included in or are eligible for inclusion in the National Register of Historic Places and an appropriate buffer zone are unsuitable.	On the basis of the consultation with the State Historic Preservation Office, there were no unsuitable findings under this criterion in the general review area.	There are no unsuitable findings, and the Horse Creek LBA Tract is not unsuitable for mining.
8. Natural Areas. Federal lands designated as natural areas or National Natural Landmarks are unsuitable.	No lands in the general area are designated as natural areas or as National Natural Landmarks.	There are no unsuitable findings, and the Horse Creek LBA Tract is not unsuitable for mining.
9. Critical Habitat for Threatened or Endangered Plant and Animal Species. Federally designated critical habitat for T or E plant and animal species, and scientifically documented essential habitat for T or E species are unsuitable.	There is no habitat meeting federally designated criteria for T or E plant or animal species within the general review area.	There are no unsuitable findings, and the Horse Creek LBA Tract is not unsuitable for mining.
10. State Listed Species. Federal lands containing habitat determined to be critical or essential for plant or animal species listed by a state pursuant to state law as T or E shall be considered unsuitable.	Wyoming does not maintain a state list of T or E species of plants or animals. Therefore, this criterion does not apply.	There are no unsuitable findings, and the Horse Creek LBA Tract is not unsuitable for mining.

UNSUITABILITY CRITERIA	GENERAL FINDINGS FOR BLM BUFFALO AND PLATTE RIVER RESOURCE AREAS (BLM 1985a 1985b) and TBNG (USFS 1985)	VALIDATION FOR HORSE CREEK LBA TRACT
11. Bald or Golden Eagle Nests. An active bald or golden eagle nest and appropriate buffer zone are unsuitable unless the lease can be conditioned so that eagles will not be disturbed during breeding season or unless golden eagle nests will be moved.	The USFS found numerous eagle nests, and buffer zones were established. It was determined that coal leasing can occur within the buffer zone if the nests are protected with stipulations and site mitigation plans. There were no unsuitable findings under this criterion, but lands involved in buffer zones are subject to special lease stipulations.	Two eagle nests (of a single pair) are found on the tract and are included in the raptor mitigation plan approved by USFWS and WDEQ/LQD. There are no unsuitable findings, and the Horse Creek LBA Tract is not unsuitable for mining.
12. Bald and Golden Eagle Roost and Concentration Areas. Bald and golden eagle roost and concentration areas on federal lands used during migration and wintering are unsuitable unless mining can be conducted in such a way as to ensure that eagles shall not be adversely disturbed.	No golden eagle roost or concentration areas occur in the general review area. Mining planned in the review area is not likely to jeopardize the continued existence of the bald eagle. Coal leasing can occur and adequate protection can be provided. There were no unsuitable findings in the general review area.	There are no unsuitable findings, and the Horse Creek LBA Tract is not unsuitable for mining.
13. Federal lands containing active falcon (excluding kestrel) cliff nesting sites and a suitable buffer zone shall be considered unsuitable unless mining can be conducted in such a way as to ensure the falcons will not be adversely affected.	After consultation with USFWS, it was determined that this criterion does not apply in TBNG and the general area.	There are no unsuitable findings, and the Horse Creek LBA Tract is not unsuitable for mining.
14. Habitat for Migratory Bird Species. Federal lands which are high priority habitat for migratory bird species of high federal interest shall be considered unsuitable unless mining can be conducted in such a way as to ensure that migratory bird habitat will not be adversely affected during the period it is in use.	After consultation with USFWS, it was determined that this criterion does not apply in TBNG.	There are no unsuitable findings, and the Horse Creek LBA Tract is not unsuitable for mining.
15. Fish and Wildlife Habitat for Resident Species. Federal lands which the surface management agency and state jointly agree are fish and wildlife habitat of resident species of high interest to the state, and which are essential for maintaining these priority wildlife species, shall be considered unsuitable.	Sage grouse leks were found on and near the TBNG review area. However, methods of mining can be developed which will not have a significant long-term impact on the grouse or their habitat. Therefore, the areas involved in leks and buffer zones are not unsuitable.	There are no unsuitable findings, and the Horse Creek LBA Tract is not unsuitable for mining.
16. Floodplains. Federal lands in riverine, coastal, and special floodplains shall be considered unsuitable where it is determined that mining could not be undertaken without substantial threat of loss of life or property.	After consultation with the USGS, it was determined that floodplains can be mined with site specific stipulations and resource protection safeguards to be developed during mining and reclamation planning. Therefore, all lands within the general review area are not unsuitable for mining.	There are no unsuitable findings, and the Horse Creek LBA Tract is not unsuitable for mining.
17. Municipal Watersheds. Federal lands which have been committed by the surface management agency to use as municipal watersheds shall be considered unsuitable.	There are no municipal watersheds in the general review area.	There are no unsuitable findings, and the Horse Creek LBA Tract is not unsuitable for mining.
18. National Resource Waters. Federal lands with national resource waters, as identified by states in their water quality management plans, and 1/4-mile buffer zones shall be unsuitable.	There are no national resource waters within the TBNG review area.	There are no unsuitable findings, and the Horse Creek LBA Tract is not unsuitable for mining.
19. Alluvial Valley Floors. All lands identified by the surface management agency, in consultation with the state, as AVFs where mining would interrupt, discontinue or preclude farming, are unsuitable. Additionally, when mining federal lands outside an AVF would materially damage the quality or quantity of water in surface or underground water systems that would supply AVFs, the land shall be considered unsuitable.	Lands along prominent drainages were considered potential AVFs pending a final determination by the state. These lands are placed in an "available pending further study" category and are not considered unsuitable.	The State will make a final determination during the mine permit application review process. No heretofore undisturbed stream valleys are included in the LBA tract, and there is no unsuitability finding.
20. State or Indian Tribe Criteria. Federal lands to which is applicable a criterion proposed by the state or Indian tribe located in the planning area and adopted by rulemaking by the Secretary are unsuitable.	The state has no applicable criteria and there is no Indian tribe located in or near the planning area. Therefore there is no unsuitability finding.	There are no unsuitability findings for this criterion on the LBA tract.

APPENDIX C

COAL LEASE-BY-APPLICATION FLOW CHART

COAL LEASE-BY-APPLICATION


BLM STATE OFFICE RECEIVES APPLICATION
Adjudicator evaluates applicant's qualifications
Confirms emergency (if applicable)
State Director (SD) notifies Governor and Regional Coal Team of application
District Manager (DM) ensures that application is in conformance with Land Use Plan (LUP)
Minerals Staff receives application and prepares report on maximum economic recovery
DM recommends amendment of LUP and/or modification of application area
DM prepares site-specific Environmental Analysis
DM prepares Environmental Analysis of LUP amendment and application
DM HOLDS PUBLIC HEARING
Applicant submits/ Adjudicator reviews surface owner consent agreement(s) (if necessary)
SD consults with Surface Management Agency, Governor, Attorney General, and Indian Tribes
SD MAKES DECISION
TO HOLD SALE
TO REJECT THE APPLICATION

APPENDIX D

BLM SPECIAL COAL LEASE STIPULATIONS
AND
FORM 3400-12 COAL LEASE

SPECIAL STIPULATIONS

In addition to observing the general obligations and standards of performance set out in the current regulations, the lessee shall comply with and be bound by the following special stipulations.

These stipulations are also imposed upon the lessee's agents and employees. The failure or refusal of any of these persons to comply with these stipulations shall be deemed a failure of the lessee to comply with the terms of the lease. The lessee shall require his agents, contractors and subcontractors involved in activities concerning this lease to include these stipulations in the contracts between and among them. These stipulations may be revised or amended, in writing, by the mutual consent of the lessor and the lessee at any time to adjust to changed conditions or to correct an oversight.

(a) ***CULTURAL RESOURCES*** -

(1) Before undertaking any activities that may disturb the surface of the leased lands, the lessee shall conduct a cultural resource intensive field inventory in a manner specified by the authorized officer of the BLM or of the surface managing agency, if different, on portions of the mine plan area and adjacent areas, or exploration plan area, that may be adversely affected by lease-related activities and which were not previously inventoried at such a level of intensity. The inventory shall be conducted by a qualified professional cultural resource specialist (i.e., archeologist, historian, historical architect, as appropriate), approved by the authorized officer of the surface managing agency (BLM, if the surface is privately owned), and a report of the inventory and recommendations for protecting any cultural resources identified shall be submitted to the Assistant Director of the Western Support Center of the Office of Surface Mining, the authorized officer of the BLM, if activities are associated with coal exploration outside an approved mining permit area (hereinafter called Authorized Officer), and the Authorized Officer of the surface managing agency, if different. The lessee shall undertake measures, in accordance with instructions from the Assistant Director, or Authorized Officer, to protect cultural resources on the leased lands. The lessee shall not commence the surface disturbing activities until permission to proceed is given by the Assistant Director or authorized officer.

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(2) The lessee shall protect all cultural resource properties within the lease area from lease-related activities until the cultural resource mitigation measures can be implemented as part of an approved mining and reclamation or exploration plan.

(3) The cost of conducting the inventory, preparing reports, and carrying out mitigation measures shall be borne by the lessee.

(4) If cultural resources are discovered during operations under this lease, the lessee shall immediately bring them to the attention of the Assistant Director or Authorized Officer, or the Authorized Officer of the surface managing agency, if the Assistant Director is not available. The lessee shall not disturb such resources except as may be subsequently authorized by the Assistant Director or Authorized Officer.

Within two (2) working days of notification, the Assistant Director or Authorized Officer will evaluate or have evaluated any cultural resources discovered and will determine if any action may be required to protect or preserve such discoveries. The cost of data recovery for cultural resources discovered during lease operations shall be borne by the surface managing agency unless otherwise specified by the Authorized Officer of the BLM or of the surface managing agency, if different.

(5) All cultural resources shall remain under the jurisdiction of the United States until ownership is determined under applicable law.

(b) ***PALEONTOLOGICAL RESOURCES*** - If paleontological resources, either large and conspicuous, and/or of significant scientific value are discovered during construction, the find will be reported to the Authorized Officer immediately. Construction will be suspended within 250 feet of said find. An evaluation of the paleontological discovery will be made by a BLM approved professional paleontologist within five (5) working days, weather permitting, to determine the appropriate action(s) to prevent the potential loss of any significant paleontological value. Operations within 250 feet of such discovery will not be resumed until written authorization to proceed is issued by the Authorized Officer. The lessee will bear the cost of any required paleontological appraisals, surface collection of fossils, or salvage of any large conspicuous fossils or fossils of significant scientific interest discovered during the operations.

(c) ***MULTIPLE MINERAL DEVELOPMENT*** - Operations will not be approved which, in the opinion of the Authorized Officer, would unreasonably interfere with the orderly development and/or production from a valid existing mineral lease issued prior to this one for the same lands.

(d) ***OIL AND GAS/COAL RESOURCES*** - The BLM realizes that coal mining operations conducted on Federal coal leases issued within producing oil and gas fields may interfere with the economic recovery of oil and gas; just as Federal oil and gas leases issued in a Federal coal lease area may inhibit coal recovery. BLM retains the authority to alter and/or modify the resource recovery and protection plans for coal operations and/or oil and gas operations on those lands covered by Federal mineral leases so as to obtain maximum resource recovery.

(e) ***RESOURCE RECOVERY AND PROTECTION*** - Notwithstanding the approval of a resource recovery and protection plan (R2P2) by the BLM, lessor reserves the right to seek damages against the operator/lessee in the event (i) the operator/lessee fails to achieve maximum economic recovery (MER) (as defined at 43 CFR 3480.0-5(21)) of the recoverable coal reserves or (ii) the operator/lessee is determined to have caused a wasting of recoverable coal reserves. Damages shall be measured on the basis of the royalty that would have been payable on the wasted or unrecovered coal.

The parties recognize that under an approved R2P2, conditions may require a modification by the operator/lessee of that plan. In the event a coalbed or portion thereof is not to be mined or is rendered unmineable by the operation, the operator/lessee shall submit appropriate justification to obtain approval by the authorized officer (AO) to leave such reserves unmined. Upon approval by the AO, such coalbeds or portions thereof shall not be subject to damages as described above. Further, nothing in this section shall prevent the operator/lessee from exercising its right to relinquish all or portion of the lease as authorized by statute and regulation.

In the event the AO determines that the R2P2, as approved, will not attain MER as the result of changed conditions, the AO will give proper notice to the operator/lessee as required under applicable regulations. The AO will order a modification if necessary, identifying additional reserves to be mined in order to attain MER. Upon a final administrative or judicial ruling upholding such an ordered modification, any reserves left unmined (wasted) under that plan will be subject to damages as described in the first paragraph under this section.

Subject to the right to appeal hereinafter set forth, payment of the value of the royalty on such unmined recoverable coal reserves shall become due and payable upon determination by the AO that the coal reserves have been rendered unmineable or at such time that the operator/lessee has demonstrated an unwillingness to extract the coal.

The BLM may enforce this provision either by issuing a written decision requiring payment of the MMS demand for such royalties, or by issuing a notice of non-compliance. A decision or notice of non-compliance issued by the lessor that payment is due under this stipulation is appealable as allowed by law.

(f) ***PUBLIC LAND SURVEY PROTECTION*** - The lessee will protect all survey monuments, witness corners, reference monuments, and bearing trees against destruction, obliteration, or damage during operations on the lease areas. If any monuments, corners or accessories are destroyed, obliterated, or damaged by this operation, the lessee will hire an appropriate county surveyor or registered land surveyor to reestablish or restore the monuments, corners, or accessories at the same location, using surveying procedures in accordance with the "Manual of Surveying Instructions for the Survey of the Public Lands of the United States." The survey will be recorded in the appropriate county records, with a copy sent to the Authorized Officer.

(g) ***RAILROAD RIGHT-OF-WAY*** - No mining activity of any kind may be conducted withing the Burlington Northern/Chicago and Northwestern railroad right-of-way. The lessee shall recover all legally and economically recoverable coal from all leased lands not within the foregoing right-of-way. Lessee shall pay all royalties on any legally and economically recoverable coal which it fails to mine without the written permission of the Authorized Officer.

Form 3400-12
(April 1984)
Formerly [illegible]

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

COAL LEASE

Serial Number

PART I. LEASE RIGHTS GRANTED

This lease, entered into by and between the UNITED STATES OF AMERICA, hereinafter called lessor, through the Bureau of Land Management, and *(Name and Address)*

hereinafter called lessee, is effective *(date)* ____________, for a period of 20 years and for so long thereafter as coal is produced in commercial quantities from the leased lands, subject to readjustment of lease terms at the end of the 20th lease year and each 10-year period thereafter.

Sec. 1. This lease is issued pursuant and subject to the terms and provisions of the:

☐ Mineral Lands Leasing Act of 1920, Act of February 25, 1920, as amended, 41 Stat. 437, 30 U.S.C. 181-287, hereinafter referred to as the Act;

☐ Mineral Leasing Act for Acquired Lands, Act of August 7, 1947, 61 Stat. 913, 30 U.S.C. 351-359;

and to the regulations and formal orders of the Secretary of the Interior which are now or hereafter in force, when not inconsistent with the express and specific provisions herein.

Sec. 2. Lessor, in consideration of any bonuses, rents, and royalties to be paid, and the conditions and covenants to be observed as herein set forth, hereby grants and leases to lessee the exclusive right and privilege to drill for, mine, extract, remove, or otherwise process and dispose of the coal deposits in, upon, or under the following described lands:

containing ____________ acres, more or less, together with the right to construct such works, buildings, plants, structures, equipment and appliances and the right to use such on-lease rights-of-way which may be necessary and convenient in the exercise of the rights and privileges granted, subject to the conditions herein provided.

PART II. TERMS AND CONDITIONS

Sec. 1. (a) RENTAL RATE - Lessee shall pay lessor rental annually and in advance for each acre or fraction thereof during the continuance of the lease at the rate of $ ____________ for each lease year.

(b) RENTAL CREDITS - Rental shall not be credited against either production or advance royalties for any year.

Sec. 2. (a) PRODUCTION ROYALTIES - The royalty shall be ______ per cent of the value of the coal as set forth in the regulations. Royalties are due to lessor the final day of the month succeeding the calendar month in which the royalty obligation accrues.

(b) ADVANCE ROYALTIES - Upon request by the lessee, the authorized officer may accept, for a total of not more than 10 years, the payment of advance royalties in lieu of continued operation, consistent with the regulations. The advance royalty shall be based on a percent of the value of a minimum number of tons determined in the manner established by the advance royalty regulations in effect at the time the lessee requests approval to pay advance royalties in lieu of continued operation.

Sec. 3. BONDS - Lessee shall maintain in the proper office a lease bond in the amount of $ ____________. The authorized officer may require an increase in this amount when additional coverage is determined appropriate.

Sec. 4. DILIGENCE - This lease is subject to the conditions of diligent development and continued operation, except that these conditions are excused when operations under the lease are interrupted by strikes, the elements, or casualties not attributable to the lessee. The lessor, in the public interest, may suspend the condition of continued operation upon payment of advance royalties in accordance with the regulations in existence at the time of the suspension. Lessee's failure to produce coal in commercial quantities at the end of 10 years shall terminate the lease. Lessee shall submit an operation and reclamation plan pursuant to Section 7 of the Act not later than 3 years after lease issuance.

The lessor reserves the power to assent to or order the suspension of the terms and conditions of this lease in accordance with, inter alia, Section 39 of the Mineral Leasing Act, 30 U.S.C. 209.

Sec. 5. LOGICAL MINING UNIT (LMU) - Either upon approval by the lessor of the lessee's application or at the direction of the lessor, this lease shall become an LMU or part of an LMU, subject to the provisions set forth in the regulations.

The stipulations established in an LMU approval in effect at the time of LMU approval will supersede the relevant inconsistent terms of this lease so long as the lease remains committed to the LMU. If the LMU of which this lease is a part is dissolved, the lease shall then be subject to the lease terms which would have been applied if the lease had not been included in an LMU.

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Sec. 6. DOCUMENTS, EVIDENCE AND INSPECTION - At such times and in such form as lessor may prescribe, lessee shall furnish detailed statements showing the amounts and quality of all products removed and sold from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost.

Lessee shall keep open at all reasonable times for the inspection of any duly authorized officer of lessor, the leased premises and all surface and underground improvements, works, machinery, ore stockpiles, equipment, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or under the leased lands.

Lessee shall allow lessor access to and copying of documents reasonably necessary to verify lessee compliance with terms and conditions of the lease.

While this lease remains in effect, information obtained under this section shall be closed to inspection by the public in accordance with the Freedom of Information Act (5 U.S.C. 552).

Sec. 7. DAMAGES TO PROPERTY AND CONDUCT OF OPERATIONS - Lessee shall comply at its own expense with all reasonable orders of the Secretary, respecting diligent operations, prevention of waste, and protection of other resources.

Lessee shall not conduct exploration operations, other than casual use, without an approved exploration plan. All exploration plans prior to the commencement of mining operations within an approved mining permit area shall be submitted to the authorized officer.

Lessee shall carry on all operations in accordance with approved methods and practices as provided in the operating regulations, having due regard for the prevention of injury to life, health, or property, and prevention of waste, damage or degradation to any land, air, water, cultural, biological, visual, and other resources, including mineral deposits and formations of mineral deposits not leased hereunder, and to other land uses or users. Lessee shall take measures deemed necessary by lessor to accomplish the intent of this lease term. Such measures may include, but are not limited to, modification to proposed siting or design of facilities, timing of operations, and specification of interim and final reclamation procedures. Lessor reserves to itself the right to lease, sell, or otherwise dispose of the surface or other mineral deposits in the lands and the right to continue existing uses and to authorize future uses upon or in the leased lands, including issuing leases for mineral deposits not covered hereunder and approving easements or rights-of-way. Lessor shall condition such uses to prevent unnecessary or unreasonable interference with rights of lessee as may be consistent with concepts of multiple use and multiple mineral development.

Sec. 8. PROTECTION OF DIVERSE INTERESTS, AND EQUAL OPPORTUNITY - Lessee shall: pay when due all taxes legally assessed and levied under the laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; restrict the workday to not more than 8 hours in any one day for underground workers, except in emergencies; and take measures necessary to protect the health and safety of the public. No person under the age of 16 years shall be employed in any mine below the surface. To the extent that laws of the State in which the lands are situated are more restrictive than the provisions in this paragraph, then the State laws apply.

Lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and the rules, regulations, and relevant orders of the Secretary of Labor. Neither lessee nor lessee's subcontractors shall maintain segregated facilities.

Sec. 9. (a) TRANSFERS

☐ This lease may be transferred in whole or in part to any perso association or corporation qualified to hold such lease interes

☐ This lease may be transferred in whole or in part to anoth public body or to a person who will mine the coal on behalf of, a for the use of, the public body or to a person who for the limit purpose of creating a security interest in favor of a lender agre to be obligated to mine the coal on behalf of the public body.

☐ This lease may only be transferred in whole or in part to anoth small business qualified under 13 CFR 121.

Transfers of record title, working or royalty interest must approved in accordance with the regulations.

(b) RELINQUISHMENT - The lessee may relinquish in writing at a time all rights under this lease or any portion thereof as provided in t regulations. Upon lessor's acceptance of the relinquishment, less shall be relieved of all future obligations under the lease or t relinquished portion thereof, whichever is applicable.

Sec. 10. DELIVERY OF PREMISES, REMOVAL OF MACHINERY, EQU MENT, ETC. - At such time as all portions of this lease are returned lessor, lessee shall deliver up to lessor the land leased, undergrou timbering, and such other supports and structures necessary for t preservation of the mine workings on the leased premises or depos and place all workings in condition for suspension or abandonme Within 180 days thereof, lessee shall remove from the premises all oth structures, machinery, equipment, tools, and materials that it elects or as required by the authorized officer. Any such structures, m chinery, equipment, tools, and materials remaining on the leased lan beyond 180 days, or approved extension thereof, shall become t property of the lessor, but lessee shall either remove any or all su property or shall continue to be liable for the cost of removal a disposal in the amount actually incurred by the lessor. If the surface owned by third parties, lessor shall waive the requirement for remov provided the third parties do not object to such waiver. Lessee sha prior to the termination of bond liability or at any other time wh required and in accordance with all applicable laws and regulation reclaim all lands the surface of which has been disturbed, dispose of debris or solid waste, repair the offsite and onsite damage caused lessee's activity or activities incidental thereto, and reclaim acce roads or trails.

Sec. 11. PROCEEDINGS IN CASE OF DEFAULT - If lessee fails to comp with applicable laws, existing regulations, or the terms, conditions a stipulations of this lease, and the noncompliance continues for 30 da after written notice thereof, this lease shall be subject to cancellation the lessor only by judicial proceedings. This provision shall not construed to prevent the exercise by lessor of any other legal a equitable remedy, including waiver of the default. Any such remedy waiver shall not prevent later cancellation for the same defau occurring at any other time.

Sec. 12. HEIRS AND SUCCESSORS-IN-INTEREST - Each obligation this lease shall extend to and be binding upon, and every benefit here shall inure to, the heirs, executors, administrators, successors, assigns of the respective parties hereto.

Sec. 13. INDEMNIFICATION - Lessee shall indemnify and hold harmle the United States from any and all claims arising out of the lesse activities and operations under this lease.

Sec. 14. SPECIAL STATUTES - This lease is subject to the Federal Wat Pollution Control Act (33 U.S.C. 1151-1175), the Clean Air Act (U.S.C. 1857 et. seq.), and to all other applicable laws pertaining exploration activities, mining operations and reclamation, includin the Surface Mining Control and Reclamation Act of 1977 (30 U.S. 1201 et. seq.)

Sec. 15. SPECIAL STIPULATIONS -

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15. SPECIAL STIPULATIONS (Cont'd) -

	THE UNITED STATES OF AMERICA
Company or Lessee Name	By
(Signature of Lessee)	(Signing Officer)
(Title)	(Title)
(Date)	(Date)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

This form does not constitute an information collection as defined by 44 U.S.C. 3502 and therefore does not require OMB approval.

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